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THE
ELECTRIC TELEGRAPH:

WAS IT INVENTED BY

PROFESSOR WHEATSTONE?

BY

WILLIAM FOTHERGILL COOKE, ESQ.

PART I.,

CONTAINING

PAMPHLETS OF 1854-6.

“A frequently renewed and still unsettled controversy has arisen upon the point of who is to be considered the first contriver of the Telegraph in the form which made it available for popular use.”

QUARTERLY REVIEW for June 1854.

LONDON:

SOLD BY W. H. SMITH AND SON, STRAND.

1857.

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pt. 1

LONDON :
W. LEWIS AND SON, PRINTERS, 21, FINCH LANE, CORNHILL.

1857

P R E F A C E.

THE first Part of this publication contains my recent and most reluctant appeal to the Public against Professor Wheatstone's perseveringly repeated misrepresentations; Mr. Wheatstone's Answer; and my Reply: the second Part contains a reprint of the proceedings in an earlier controversy between us; when the late Sir Isambard Brunel and Professor Daniell, having been called in as Arbitrators to adjust our relative claims to the Invention of the Electric Telegraph, awarded the questions in dispute in my favour. *Award, p. 14.*

The arbitration papers and drawings will be found, I hope, to contain matter of more permanent and general interest than the personal controversy which has called them forth.

My object, in this Preface, is to state, very shortly and in order of date, the leading facts established by the documents now published, with references to the documents themselves as my authorities.*

* The *pages* referred to are those of Part I.: the *sections* referred to are those of the Arbitration Papers, reprinted in Part II.

Mr. Ronalds' Publication, 1823.

In 1823, Mr. Francis Ronalds, a gentleman well known in the scientific world, published his "Descriptions of an Electrical Telegraph and of some other Electrical apparatus;" a work of originality and merit, although as Mr. Ronalds proposed to work by frictional electricity, through a wire enclosed in a glass tube, his telegraph was not adapted for practical use.

Professor Wheatstone's Experiments on Sound and Electricity. 1823—1837. *Wheatstone's Answer*, p.114.

Possibly it might be Mr. Ronalds' publication which led to Mr. Wheatstone's experiments on the transmission of sound and electricity: for he fixes the year 1823 as the date at which his labours commenced. He says:—

"When I made in 1823 my important discovery, that sounds of all kinds might be transmitted perfectly and powerfully through solid wires, and reproduced in distant places, I thought that I had the most efficient and economical means of establishing a telegraphic (or rather a telephonic) communication between two remote points that could be thought of. My ideas respecting establishing a communication of this kind between London and Edinburgh, you will find in the 'Journal of the Royal Institution' for 1828. Experiments on a larger scale, however, showed me that the velocity of sound was not sufficient to overcome the resistances and enable it to be transmitted efficiently through long lengths of wire. I then turned my attention to the employment of electricity as the communicating agent; the experiments of Ronalds and others had failed to produce any impression on the scientific world; this want of confidence resulted from the imperfect knowledge we possessed of the velocity and other

properties of electricity; some philosophers made it a few miles per second, others considered it to be infinite; if the former were true, there would not be much room for hope; but if the velocity could be proved to be very great, there would be encouragement to proceed. I undertook the inquiry, and with the result the whole scientific world is acquainted. At the same time I ascertained that magnetic needles might be deflected, water decomposed, induction sparks produced, &c., through greater lengths of wire than had yet been experimented upon. In the following year, at the request of the Royal Society, I repeated these experiments with several miles of insulated wire, and the results were witnessed by the most eminent philosophers of Europe and America. I ascertained experimentally (which had never been done before) many of the conditions necessary for the production of the various magnetic, mechanical, and chemical effects in very long circuits; and I devised a variety of instruments by which telegraphic communication should be realised on these principles."

In June, 1836, Mr. Wheatstone "repeated his experiments" at "a course of lectures" at King's College; which were noticed nine months afterwards by the "Magazine of Popular Science," a monthly periodical, in its number for the month of March, 1837, published immediately after my first visit to Mr. Wheatstone.

Mr. Wheatstone's lectures at King's College.

June 1836, pp. 52 & 152.

Noticed by the Magazine of Popular Science for March 1837, pp. 52 & 153.

The "apparatus" of which Mr. Wheatstone was in possession at the date of the above publication, is drawn and described in my Reply.

P. 155.

Just a year before Mr. Wheatstone's publication Origin of Mr.

Cooke's Tele-
graph.
March 1836.

of March 1837, having recently, on account of the state of my health, resigned my commission as an officer in the Indian army, I happened to witness, at Heidelberg, "one of those well known experiments on electricity considered as a possible means of communicating intelligence, which had been tried and exhibited, from time to time, during many years, by various philosophers."

*Award of Sir
Isambard Bru-
nel and Pro-
fessor Daniell,
p. 14.*

"Struck with the vast importance of an instantaneous mode of communication to the railways then extending themselves over Great Britain, as well as to Government and general purposes, and impressed with a strong conviction that so great an object might be practically attained by means of electricity," I immediately directed my "attention to the adaptation of electricity to a practical system of telegraphing." Within three weeks I constructed a practical electric telegraph of the magnetic needle form; and soon afterwards several instruments of the mechanical form. The distinction between the two forms is explained in the Arbitration Papers, at section 29.

§ 29.

Commence-
ment of the
connexion
between Mr.
Cooke and Mr.
Wheatstone.
Feb. 1837.
P. 15.

"In February, 1837," (to quote the Award again,) "while engaged in completing a set of instruments for an intended experimental application of his telegraph to a tunnel on the Liverpool and Manchester Railway, Mr. Cooke became acquainted,

through the introduction of Dr. Roget, with Professor Wheatstone.”

I had applied to Dr. Faraday, and afterwards to Dr. Roget, for advice respecting the proportions of the electro-magnet used in my alarum and in my mechanical telegraphs. On the 27th February 1837, I called on Mr. Wheatstone upon the same subject, and the circumstances of our earlier interviews are explained at p. 33.

P. 33.

Two months afterwards we jointly applied for the first patent for an Electric Telegraph, immediately after a meeting at our solicitor's office, at which we arranged a memorandum of the terms of our partnership. At this meeting a long discussion took place; and Mr. Wheatstone fills two pages with his account of it. He expressly admits that I urged that my invention was more valuable than his; while he considered, he says, that, as we put ourselves on an equality, to allow his name which was known, to follow mine which was unknown, might be construed into his admitting that my share of the invention was greatly superior to his. The memorandum is extant; and a copy of it will be found at page 151. It contains, in Mr. Wheatstone's hand-writing, and also in mine, the names of the “joint inventors” of the “Electro-magnetic Telegraph.” Both in his hand-writing and in my own, my name takes precedence of his.

Application
for First
Patent.
Partnership
arrangements.
May 1837.

P. 115.

P. 151.

Patents taken
out in the
names of
Cooke and
Wheatstone.
1837-8.
§ 711.

The patents were accordingly taken out in the names of the “joint-inventors,” Messrs. Cooke and Wheatstone; “in England in June 1837, in Scotland in December 1837, and in Ireland in April 1838.”

Partnership
Deed.
Nov. 1837.

In November 1837 our partnership arrangements were completed, through the friendly mediation of Sir Benjamin Hawes; and my name, without objection or discussion, took the lead in the partnership deed,

Award, p. 16. which “vested in Mr. Cooke, as the originator* of the undertaking, the exclusive management of the invention in Great Britain, Ireland, and the colonies, with the exclusive engineering department as between themselves, and all the benefits arising from the laying down of the lines and the manufacture of the instruments.”

Mr. Cooke's
Letter to Mr.
Wheatstone.
Aug. 1838.
P. 23.

I soon found that Mr. Wheatstone was silently appropriating to himself the whole credit of the invention; and as early as August 1838, I addressed to him an earnest remonstrance on this subject. His promises to do me justice led to no result; and in 1840 the evil was aggravated by his invention of a

51.

* When Mr. Wheatstone says that in one of my letters to him I made a claim “not indeed as original projector and leading inventor, for that I did not ask or desire,” he unaccountably omits the end of the sentence—“*but as the inventor equally and jointly with yourself, standing in point of merit on precisely the same ground.*”

beautiful and promising form of the mechanical telegraph, which he put forward at home and abroad as his sole invention, although only “an improved reproduction of my own mechanical arrangements.” § 95.

Placed in a questionable position in communications with railway authorities in England, and almost excluded from negotiation with continental governments, I felt myself now peremptorily called upon to vindicate without further delay my connexion with the invention. I wrote to Professor Wheatstone; and his answer will be found at page 113. Here, P. 113. for the first time, he openly maintains his ground, and vindicates to himself the sole invention of both forms of the Electric Telegraph.

Our differences were now referred to Sir Isambard Brunel and Professor Daniell. The Agreement of Arbitration, the statements of the parties, and the decision of the Arbitrators, are now before the public. Part II.

The Award gave me entire satisfaction, and Mr. Wheatstone subscribed a “cordial and grateful” acknowledgement of “the correctness of the facts stated” P. 18. in it; but I soon found that he had contrived to explain it away. In May 1843, I complained of this through my solicitor to his; and was silenced, if not satisfied, by a written assurance that “Mr. Wheatstone does not desire to escape from a single conclusion which the Award warrants.” P. 40.

Two years afterwards Mr. Wheatstone dropped an
 P. 40. incautious expression, disclosing the existence of a
 letter; which, in order to counteract the effect of the
 Pp. 83 & 164. Award, or to provide himself with something which
 he could show instead of the Award, he had induced
 his friend Mr. Daniell to write to him. I remained
 P. 169. in ignorance of the contents of this private award
 till last year; when Mr. Wheatstone found himself
 compelled to publish Mr. Daniell's letter in his answer
 to my pamphlet.

Mr. Wheatstone always showed an equal readiness to
 throw off his share of risk in times of difficulty, and
 to claim his utmost share of benefit when the difficulty
 had been overcome. He is now convicted, on his own
 confession, of a misrepresentation of our pecuniary
 arrangements. On this subject, it is enough to refer
 P. 232. to the figures given by my Reply.

It may also suffice to refer to the introductory pages
 Pp. 1—8. of my first pamphlet for an explanation of the circum-
 stances which compelled me, after thirteen years' for-
 bearance, to publish a correct statement of my trans-
 actions with Professor Wheatstone.

W. F. C.

OAKLANDS, STOCKBRIDGE.

May 1857.

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THE ELECTRIC TELEGRAPH,

&c.

THOSE whose interest in the Electric Telegraph is lively enough to induce them to read the statement of facts contained in the following pages, need scarcely be informed, that the unwearied invisible messenger, now employed daily and nightly, by land and by water, in carrying the despatches of commerce and war to every corner of Europe, was first brought into the service of mankind by an invention for which an English patent was granted to William Fothergill Cooke and Charles Wheatstone, on the 12th June, 1837. America and Germany may have since put forth claims to the honour of the discovery, and some notes and hints in anticipation of it may have been brought together, within the last few years, from various parts of the world, to gratify the curiosity excited by its success; but no account of a practical Electric Telegraph, pub-

lished or written at a date earlier than that of the specification of the patent of June 1837, has yet been produced.

It has been supposed by many persons that this invention of the Electric Telegraph, in the year 1837, was the result of a lengthened process of investigation and experiment on the part of the eminent Professor named in my title page, aided towards the end of his labours by a partner, variously misrepresented as the capitalist, the mechanic, or the man of business, with whom he is understood to have associated himself just before taking out his patent. Documents are now in the press which will tell a very different tale; documents which were already in print thirteen years ago, and of which a copy has remained in Professor Wheatstone's possession ever since. They will convince the most prejudiced, that it was not from his philosophical information, nor from his experimental ingenuity, that Professor Wheatstone acquired his position as one of the patentees of the first practical Electric Telegraph; but from a communication made to him in confidence by the writer, who was then completing the practical invention, and was about to take out a patent for it; who was in possession of practical Electric Telegraphs already made by him, and fit for practical use; who had worked out into a pamphlet a detailed practical system of electric telegraphing; who was in negotiation with a railway company for the practical application of the inven-

tion upon their line; and who, having consulted Professor Wheatstone (before the Professor had done anything practical at all) as a scientific man, on a scientific question affecting the proportions of part of the apparatus, and having tried experiments with him upon the point submitted for his advice, was induced, by the adviser's scientific acquirements, and by pecuniary considerations, to admit him to a share in the patent, as second partner. I may just mention by the way, that I was not a capitalist, nor a mechanic, nor a man of business, but a military man, lately returned from service in India, and wholly inexperienced in patents and business arrangements, to which, on the other hand, my scientific coadjutor was already accustomed.

It was at the end of February, 1837, that I consulted Mr. Wheatstone; and the patent was completed, as already mentioned, in the following June. Very soon afterwards, I arranged and put up an experimental telegraph to Camden Town, for which the Engineer and Directors of the London and Birmingham Railway Company had given an order, after witnessing a series of experiments, which we had tried at Euston Station by their permission, obtained through the influence of my friends. The invention at once became a subject of public interest; and I found that Mr. Wheatstone was talking about it everywhere in the first person singular. I remonstrated with him. I cautioned him as a friend that he was getting himself into a false position.

At length, in 1840, I required that our positions, relatively to the invention and to each other, should be ascertained by arbitration. Arbitrators of eminent scientific attainments were appointed, by a formal legal instrument, to inquire into the facts and report the result. Elaborate statements were laid before them, and printed for their use. A volume of drawings, illustrating all the several forms and stages of the invention, was prepared and zinco-graphed. The Arbitrators made their Award; Mr. Wheatstone subscribed his assent to it; but scarcely had it been published, when I heard of whispers in scientific circles that it was only a concession to quiet the business partner, and meant nothing. And so completely has it now been explained away, that a recent article in the "Quarterly Review," of evident research and apparent candour, ignores it altogether.

In April, 1841, two men, whose names might have obtained for their lightest opinion a candid consideration, and who are not now living to defend their judgment—the late Sir Isambard Brunel and Professor Daniell—with the fullest means of information before them, found me "*entitled to stand alone,*" as the person "*to whom this country is indebted for having practically introduced and carried out the Electric Telegraph as a useful undertaking, promising to be a work of national importance.*" Professor Wheatstone deliberately ratified this decision. In June, 1854, the writer of

the article in the "Quarterly," without mentioning any discovery, during the interval which has elapsed since the date of the award, of further evidence tending to a different conclusion, pronounces anonymously that Mr. Wheatstone is entitled to stand alone, on the same ground. The Public will judge, when the papers are published, which of the two verdicts is the right one.

My present explanation, however, is not directed against the "Quarterly Review," but against Mr. Wheatstone. His egotism caused the misconception to which the Reviewer has given utterance. He must have seen the article published in June. He knew that it contained statements, in his favour and to my prejudice, contrary to the truth and to his own solemn admission. He might have contradicted these mis-statements in the September number of the Review: by allowing them to remain uncontradicted, he has virtually adopted them.

Nor is this my only charge against him. In the spring of 1843, by a new arrangement then made between us, I became the sole proprietor of the Patents, Mr. Wheatstone receiving, in exchange for his share, the grant of a liberal royalty on all lines of telegraph which should be constructed under them, with a discharge from present claims, and a dispensation from future liabilities. In my character of sole proprietor, I so managed the patents as to make his fortune, within three years after his retirement, by the sale for him on his

own terms of the royalty reserved in his favour. On the sale of the patents to the Electric Telegraph Company in 1845, I made arrangements for his scientific connexion with the undertaking on a footing alike honourable and remunerative; a connexion which he himself terminated, in consequence of annoyances attributable to his own indiscretion (or perhaps misfortune), in his dealings with other inventors. Yet, after all this, he has allowed his friends to give out that, on the sale to the Telegraph Company, he was induced to part with his share in the patents at an inadequate price, under conditions by which the further exercise of his inventive talents was jealously prohibited.

He has perhaps inferred, from my long-continued silence, that no amount or repetition of provocation would induce me to come forward; or he has forgotten the contents of the arbitration papers. If my readers should be persuaded to follow me into the volume of documents which I am about to publish, they will be only less surprised at my forbearance, than at the hardihood which has worn it out. For thirteen years, with the means of self-protection in my hands, I have allowed myself to be deprived, in the estimation of many persons whose good opinion I value, of the credit justly due to the origination of one of the great inventions of the age. I have remained quiet under misconceptions, always humiliating, sometimes even obstructive in business. The

errors of the article in the "Quarterly Review" are only a reproduction, in a mitigated form, of misstatements which I have passed over in fifty inferior publications. But I yield at length to the urgent representations of friends, who have interested themselves in the invention, and watched its progress, from the commencement; and in justice to those friends themselves, as well as to my family and connexions—to the high character of the Periodical which has been misled, and to the honoured memory of the Arbitrators—I shall no longer hesitate to make public the overwhelming body of evidence which I have hitherto so patiently held back; avoiding, as far as possible, anything like a personal attack upon Mr. Wheatstone, though I cannot spare him the humiliation of retiring from a position, in which he ought never to have allowed himself to be placed.

Whether I am to throw the blame on the indiscreet partiality of his friends, or on his own scientific prejudices, or want of memory or of candour, it is evident, as a matter of fact, that he has possessed himself of the whole credit of having originated the Practical Electric Telegraph, for which we took out the Patent in June 1837; though he knows and has admitted that I was the originator of it.

He has also caused or permitted a misrepresentation of the business arrangements of 1843 and 1845.

These being the two points on which I consider

that he has compromised himself—the two charges, if I may so call them, which I have to prove; I shall proceed, without further preface, to extract from the article in the “Quarterly Review,” above referred to, some portions of the erroneous statements which have induced me to lay my counter-statement before the Public. I shall next give the substance of the deed of reference under which the above-mentioned arbitration took place; and shall then set out the Award and Mr. Wheatstone's assent to it. These will lead me to explain the nature of the documents on which the Arbitrators founded their decision, and which are now in the press; and to give some extracts for the information of readers who may not have access to my larger publication. Having thus given a sketch of the evidence by which my first charge is made out, I shall pass on to a statement, in support of my second charge, of the circumstances under which Mr. Wheatstone's share in the Patents was assigned to me in the year 1843; of the arrangements made two years afterwards for the sale of his royalty on the formation of the Electric Telegraph Company; of his appointment as the Company's scientific adviser; and his resignation of that appointment.

To begin then with some extracts from the article in the “Quarterly.”

“A frequently renewed and still unsettled controversy has arisen upon the point of who is to be considered the first contriver of the Telegraph in the form which made it

available for popular use. Two names alone are now put forward to dispute the claim with Wheatstone—Steinheil of Munich and Morse of New York. From a communication of M. Arago to the French Academy of Sciences, it appears that the Telegraph of Steinheil was in operation, for a distance of seven miles, on the 19th of July, 1837, the same month in which Wheatstone put his own contrivance to the test upon the North Western Railway. But besides that the Patent of Wheatstone was taken out in the preceding June, and was itself founded upon previous and thoroughly successful experiments, there is another material circumstance which gives him a claim to priority over Steinheil, viz., that the latter published no description of his instrument until August 1838, that he altered and improved it in the interval, and that the only accounts we have of his contrivance describe its amended and not its original form. It was, however, a very meritorious performance, and in addition to its other excellences, Steinheil was the first who employed the earth to complete the circuit—a most important fact, which we shall explain hereafter. Still his Telegraph was inferior in its mechanical arrangements to that of Wheatstone, and the inventor himself soon abandoned it in favour of a modification of the instrument of Morse.”—Pp. 125-6.

“The question of priority is, in our opinion, after all of no sort of importance, at least as regards the rival claims of Wheatstone and Steinheil. When the progress of science has prepared the way for a great discovery, two geniuses will occasionally take the step together, because each is able to take the step of a giant. It was thus that the Calculus was found out by both Newton and Leibnitz, and the place of Neptune in the heavens by both Adams and Leverrier. It was the same with the Telegraph. The

investigations of Wheatstone and Steinheil were entirely independent of each other, and it cannot lessen the merit of either that there was a second man in Europe who was equal to the task.

“There are some who dispute Professor Wheatstone’s claim, by urging that, inasmuch as all the main features of the Telegraph existed before he took out his Patent, there was nothing left to invent. It is true that much had been done, but it is equally certain that there was much to do. When Wheatstone first directed his attention to electricity as a means of communicating thoughts to a distance, the telegraph was a useless and inoperative machine. He and his partner established as a working, paying fact what had hitherto been little better than a philosophic toy. To those who now disparage the Professor’s labours we think it sufficient to reply by the admirable saying of the French *savant*, M. Biot—‘Nothing is so easy as the discovery of yesterday; nothing so difficult as the discovery of to-day.’”—Pp. 126-7.

I will now make some extracts from the deed of reference.

“ARTICLES of AGREEMENT made this 16th day of November 1840, between WILLIAM FOTHERGILL COOKE, - - - Esq., of the one part, and CHARLES WHEATSTONE, - - - Esq., of the other part.

“WHEREAS the parties hereto are the co-proprietors of certain English, Scotch and Irish patents granted to them, or one of them, in and since the year 1837, for an Invention commonly called the “Electric Telegraph,” and for improvements thereon: And whereas the said William Fothergill Cooke having represented to the said Charles Wheatstone that he the said W. F. Cooke, has been

subjected to constant annoyance and serious injury by alleged erroneous notions, which have been (as he states) generally received of his position relative to the said C. Wheatstone, in consequence of alleged erroneous statements, alleged to have been contained in a long series of widely circulated publications; It has therefore been agreed between the parties hereto, upon the said W. F. Cooke's application, that the relative positions of the said parties should be ascertained by arbitration as hereinafter mentioned."

After mentioning a second subject of reference which has ceased to be of any importance, the deed proceeds :—

"Now these presents witness, that in consideration of the premises, it is hereby mutually agreed between the said parties hereto, as follows; that is to say—

"First, That MARC ISAMBARD BRUNEL, of the Thames Tunnel, London, Esq., shall be arbitrator on behalf of the said W. F. Cooke; and JOHN FREDERICK DANIELL, of Norwood, Surrey, Professor of Chemistry in King's College, London, arbitrator on behalf of the said C. Wheatstone, for the purposes hereinafter mentioned."

The second clause contains a power, which was not exercised, of appointing a third arbitrator; and the deed then states the principal subject of reference, in the following terms :—

"Thirdly. That the Arbitrators shall, with all convenient expedition, ascertain the relative positions of the said parties hereto, in the following manner, namely: The arbitrators shall investigate, and they or any two of them shall conclusively determine by their written award, in

what shares, and with what priorities and relative degrees of merit, the said parties hereto are co-inventors of the Electric Telegraph; due regard being paid to the original projection thereof; to the developement of its laws and properties; to the practical introduction of it into the United Kingdom; to the improvements made upon it since its introduction there; and to all other matters which the arbitrators, or any two of them, shall in their discretion think deserving of their consideration."

Then follow various powers and formal clauses; the signatures and seals of the parties; and the attestations of their solicitors.

Five months after the date of the above deed of reference, viz. on the 27th April, 1841, Sir Isambard Brunel and Professor Daniell made their Award as follows:—

"As the Electric Telegraph has recently attracted a considerable share of public attention, our friends, Messrs. Cooke and Wheatstone, have been put to some inconvenience, by a misunderstanding which has prevailed respecting their relative positions in connexion with the invention. The following short statement of the facts has, therefore, at their request, been drawn up by us the undersigned Sir M. Isambard Brunel, Engineer of the Thames Tunnel, and Professor Daniell, of King's College, as a document which either party may at pleasure make publicly known.

"In March, 1836, Mr. Cooke, while engaged at Heidelberg in scientific pursuits, witnessed, for the first time, one of those well-known experiments on electricity, considered as a possible means of communicating intelligence, which have been tried and exhibited from time to time, during

many years, by various philosophers. Struck with the vast importance of an instantaneous mode of communication, to the railways then extending themselves over Great Britain, as well as to government and general purposes, and impressed with a strong conviction that so great an object might be practically attained by means of electricity, Mr. Cooke immediately directed his attention to the adaptation of electricity to a practical system of Telegraphing; and, giving up the profession in which he was engaged, he, from that hour, devoted himself exclusively to the realization of that object. He came to England in April, 1836, to perfect his plans and instruments. In February, 1837, while engaged in completing a set of instruments for an intended experimental application of his Telegraph to a tunnel on the Liverpool and Manchester Railway, he became acquainted, through the introduction of Dr. Roget, with Professor Wheatstone, who had for several years given much attention to the subject of transmitting intelligence by electricity, and had made several discoveries of the highest importance connected with this subject. Among these were his well-known determination of the velocity of electricity, when passing through a metal wire; his experiments, in which the deflection of magnetic needles, the decomposition of water, and other voltaic and magneto-electric effects, were produced through greater lengths of wire than had ever before been experimented upon; and his original method of converting a few wires into a considerable number of circuits, so that they might transmit the greatest number of signals, which can be transmitted by a given number of wires, by the deflection of magnetic needles.

“In May, 1837, Messrs. Cooke and Wheatstone took out a joint English patent, on a footing of equality, for their

existing inventions. The terms of their partnership, which were more exactly defined and confirmed in November, 1837, by a partnership deed, vested in Mr. Cooke, as the originator of the undertaking, the exclusive management of the invention, in Great Britain, Ireland, and the Colonies, with the exclusive engineering department, as between themselves, and all the benefits arising from the laying down of the lines, and the manufacture of the instruments. As partners standing on a perfect equality, Messrs. Cooke and Wheatstone were to divide equally all proceeds arising from the granting of licenses, or from sale of the patent rights; a per-centage being first payable to Mr. Cooke, as manager. Professor Wheatstone retained an equal voice with Mr. Cooke in selecting and modifying the forms of the telegraphic instruments, and both parties pledged themselves to impart to each other, for their equal and mutual benefit, all improvements, of whatever kind, which they might become possessed of, connected with the giving of signals, or the sounding of alarums, by means of electricity. Since the formation of the partnership, the undertaking has rapidly progressed, under the constant and equally successful exertions of the parties in their distinct departments, until it has attained the character of a simple and practical system, worked out scientifically on the sure basis of actual experience.

“ Whilst Mr. Cooke is entitled to stand alone, as the gentleman to whom this country is indebted for having practically introduced and carried out the Electric Telegraph as a useful undertaking, promising to be a work of national importance; and Professor Wheatstone is acknowledged as the scientific man, whose profound and successful researches had already prepared the public to receive it as a project capable of practical application; it is to the

united labours of two gentlemen so well qualified for mutual assistance, that we must attribute the rapid progress which this important invention has made during the five years since they have been associated.

M^C I^D BRUNEL.
J. F. DANIELL.

London, 27th April, 1841.”

Before the signature of this Award, the draft of it had been handed to Professor Wheatstone for consideration, and, by his request, the particulars of his earlier experiments, as they now stand, had been added to the original form in his own words. To the Award thus amended, and which, being made by agreement, was a treaty as well as a decision,* Professor Wheatstone, under the advice of his able and experienced legal adviser, followed me in subscribing a cordial and grateful assent as follows :—

* I cannot better illustrate the real nature of the Award, than by printing a letter which I wrote to Mr. Wheatstone's arbitrator, Professor Daniell, on the day before the final meeting of the 27th of April. The parts omitted have no bearing upon the question of invention.

Kidbrooke Lodge,

26th April, 1841.

“DEAR SIR,

You have no doubt received a letter which I wrote to you to-day, requesting that a meeting might take place before Mr. Wheatstone's departure for the Continent, in order that we might at once conclude the basis of an amicable arrangement, and request Mr. Richardson and Mr. Wilson to lose no time in preparing such legal documents as might be necessary, or that we might come to a final understanding that an amicable settlement is unattainable, and without further fruitless negotiations proceed with the arbitration immediately on Mr. Wheatstone's return.

"GENTLEMEN, LONDON, 27th April, 1841.

We cordially acknowledge the correctness of the facts stated in the above document, and beg to express our grateful sense of the very friendly and gratifying manner in which you have recorded your opinion of our joint labours, and of the value of our invention.

We are, Gentlemen,
With feelings of the highest esteem,
Your obedient Servants,

WILL^M F. COOKE.
C. WHEATSTONE.

SIR M. ISAMBARD BRUNEL, and
J. F. DANIELL, Esq., Professor, &c. &c."

At the time when the Award was thus made and agreed to, Mr. Wheatstone and myself, our solicitors and the arbitrators, were each of us in possession of a printed book, containing—(1) my Case, or statement of facts : (2) Mr. Wheatstone's Case, or statement of facts : (3) my solicitor's opening address, or summary of evidence : also of a volume of zincographed

I have since seen Sir I. Brunel, who has kindly agreed to devote any hour to-morrow to the subject.

That the Arbitrators and Mr. Wheatstone may be fully in possession of my views, I now hand you a final statement of what I will, and of what I will not, concede. At the last meeting at which I was present, the Arbitrators expressed strongly their anxiety to promote an amicable settlement. I cordially responded to their wish ; and on being requested, as plaintiff, to state what I claimed, I prepared a memorandum for the signature of the Arbitrators and the parties. I there claimed the least which I think I can be expected to accept ; and by that memorandum (which I again enclose) I am still willing to abide.

drawings, with printed tables of reference to them. Almost the whole of the original impression of the cases and address was destroyed, by Professor Daniell's desire, to prevent publicity; but a few copies were preserved by the different parties to the enquiry, one of which I am now reprinting,† with the drawings, and my early pamphlet on the Electric Telegraph.

My statement of the facts, so far as they remain material, was shortly as follows:—Having returned

Professor Wheatstone has adopted the greater portion of it, but he has transposed the paragraphs, so as to give precedence to his name. To this I cannot consent, as his connexion with the practical undertaking commenced (even by his own showing) at a comparatively recent date, and in consequence of my urgent invitation. The scientific field I left open to him in the most liberal spirit. I have, at your suggestion, expressed in different words the idea which I before intended to express by the word "Projector;" and I have also introduced Mr. Wheatstone's summary of his researches, and adopted some others of his expressions.

* * * * * *

I beg that these may be received as my final propositions.

* * * * * *

I am, dear Sir,

Yours very truly,

WILL^M F. COOKE.

J. F. DANIELL, Esq."

† The printed papers were placed at the disposal of the Arbitrators, by a written agreement, on that and other points, which was signed by the parties and by the Arbitrators, at the meeting of the 27th of April, immediately after the signature of the Award.

The same agreement threw all the expenses of the arbitration on the Partnership: a condition on which I insisted, as my outlay (including printing, drawing and zincographing) exceeded Mr. Wheatstone's, tenfold.

from India on leave of absence, on account of the state of my health, and afterwards resigned my commission, I was studying anatomy and modelling my dissections at Heidelberg, when, in March, 1836, I happened to witness one of the common applications of electricity to telegraphic experiments, which had been repeated without practical result for half a century. Perceiving that the agent employed might be made available to purposes of higher utility than the illustration of a lecture, I at once abandoned my anatomical pursuits, and applied my whole energies to the invention of a practical Electric Telegraph, which, within three weeks, I accomplished in the telegraph designated "Part B" in the first sheet of the drawings, now in course of publication. I soon afterwards made another Electric Telegraph of a different construction, also shown in the drawings. In the summer of 1836, I worked out an entire practical system of electric telegraphing, in the pamphlet above referred to. In the winter of the same year, I made a conditional arrangement with the Liverpool and Manchester Railway Company, for the erection of an Electric Telegraph in the tunnel at Liverpool. In the following February, when about to apply for a patent, I asked the advice of Dr. Faraday and Dr. Roget on the construction of the electro-magnet employed in part of the apparatus, as explained below. Dr. Roget advised me to consult Professor Wheatstone, which I did on the 27th February, 1837. That Mr. Wheatstone

had not yet got beyond the “philosophic toys” of his friend the Reviewer, appears by his own statement of what he had done, in the introductory part of the Award: where his “much” (fruitless) “attention to the subject” “for several years”—the old lecture-room experiments, annually repeated, yet remaining unapplied—his “greater lengths of wire than had ever before been experimented upon;” and his economical key-board, which has never been used—would seem to have been interpolated for no other purpose than to set off, by way of contrast, the practical realities of my “plans and instruments.” He eventually joined me in the patent; in which my name took the lead; towards the expense of which he contributed more than half; and which was charged in my favour with £130 for the expenses of my past experiments, without any allowance to Mr. Wheatstone for any past experiments of his. Whereas afterwards, in 1839, when his experiments had mainly led to the completion of materials for a second joint-patent, (supposed at the time to be of value, but which has not come into use,) he asked and obtained priority for his name, and an allowance for his expenses.

Facts thus conclusive in themselves were rendered, if possible, doubly conclusive, by Mr. Wheatstone’s attempts to explain them away. In the Case which he laid before the Arbitrators, he imprudently committed himself to a great number of particular statements, about things which had been done, and

things which had been said ; statements not very material perhaps if well founded, but the incorrectness of which was conclusively proved by documentary and circumstantial evidence. On the one side, was a simple narrative, probable in itself and consistent with circumstances, and supported by documents and instruments, and by the personal knowledge of numerous respectable witnesses : on the other side, a series of plausible but unsupported assertions, all of which were disproved. I venture to say, that no candid person can read my Case without believing it ; nor Mr. Wheatstone's Case, with my solicitor's summary of the evidence in answer to it, without full conviction that every material part of the Case is incorrect, and that the answer is beyond the reach of a reply.

A summary of evidence, and more especially one of circumstantial evidence, is in its nature scarcely susceptible of abridgment ; nor could extracts of individual instances, of statements inconsiderately made and conclusively answered, convey a just notion of the whole effect of an argument which deals in like manner with a score of such instances besides. Yet, as I cannot expect to persuade any great number of persons to read the documents themselves, I must extract some portions of narrative from my Case, for the information of a class of readers who may be willing to follow me through a pamphlet, but who would be deterred by the expense and bulk of a volume. I will begin by extracting,

from the earlier part of my Case, a letter which I wrote to Professor Wheatstone two or three years before the arbitration, as follows :—

“MY DEAR SIR,

22nd August, 1838.

I was surprised to hear this morning that the Association had already met; having anticipated some communication from you before your departure from London, under the supposition that you would introduce the Telegraph to the notice of the *savans* there assembled. I have long been annoyed by the urgent requests of my friends to publish my claims to the invention, but invariably declined; more recently, a well-known scientific personage has been most urgent to bring it forward at the present meeting, but I have refused, for two reasons; first, as I believe an invidious feeling rather than zeal in my cause dictated his offer, but more especially as I prefer leaving my cause entirely in your hands, and thereby evincing my sense of the confidence you have placed in me by entrusting your pecuniary interest in the patent to my honour and control. So great a publicity has been given to the subject, that I cannot doubt it will be made a prominent topic in your section, which will give you the most favourable opportunity of placing the facts briefly before the public in their true light. I believe you have ever considered me as the individual, by whose solitary exertions, for a lengthened period, the system was prepared for practical application, in other words, as the Projector; and I employ your frequently repeated expression in saying that you consider us on an equal footing as inventors. The former post as Projector explains most satisfactorily to the world why my name takes the lead in the patent, without casting the slightest shade over yours as a scientific

man. Do, my dear sir, make a point of settling this question in the manner which your own feelings as a gentleman and a man of science will dictate, that it may rest henceforth and for ever: our mutual good understanding, which I trust has been gradually strengthening, will be confirmed by this step. It is finally determined that iron and lead tubing are to be employed only, on the Great Western Railway; a large supply of materials will be ready in a few days, when I expect to proceed rapidly.

Yours faithfully,

WILL^M F. COOKE.

C. WHEATSTONE, Esq.”

The incident which first turned my attention to the Electric Telegraph, is thus mentioned in the Case:—

“In the month of March, 1836, I was engaged at Heidelberg in the study of anatomy, in connexion with the interesting and by no means unprofitable profession of anatomical modelling; a self-taught pursuit, to which I had been devoting myself with incessant and unabated ardour, working frequently fourteen or fifteen hours a day, for about eighteen months previous. About the 6th of March, 1836, a circumstance occurred which gave an entirely new bent to my thoughts. Having witnessed an electro-telegraphic experiment, exhibited about that day by Professor Moncke, of Heidelberg, who had I believe taken his ideas from Gæuss, I was so much struck with the wonderful power of electricity, and so strongly impressed with its applicability to the practical transmission of telegraphic intelligence, that from that very day I entirely abandoned my former pursuits, and devoted myself thenceforth with equal ardour, as all who know me can testify, to the prac-

tical realization of the Electric Telegraph ; an object which has occupied my undivided energies ever since."

Then follows a description of Professor Möncke's experiment, which I will extract, after a few words of general explanation for the benefit of such of my readers as may happen to be unacquainted with the principles on which telegraphing by electricity is founded.

If some pieces of copper and zinc are arranged alternately in a trough, partially filled with acidulated water or wet sand, they form what is called a *voltaic battery* ; and if, from the copper at one end, a piece of wire, or *metallic circuit*, is carried for a greater or less distance round to the zinc at the other end, a current of electricity immediately passes through the wire, and continues to flow while the connexion is maintained. If the wire be cut in two, the current instantly ceases to flow ; it begins again when the parts are brought together, and so on. Now, for a long time before the invention of the Electric Telegraph, it was well known that if a common magnetic or compass needle were suspended near and parallel to the wire, the passing of the current through the wire would have a tendency, during the continuance of the current, to make the needle change its position, and hang across the wire instead of parallel to it. It was also well known, that this *deflecting* force of the electric current could be *multiplied*, by coiling the wire many

times round a space containing the needle; the wire being *insulated* by being covered with a non-conducting material, so as to ensure the passing of the current through the whole length of the wire, without finding a shorter passage across at some point of contact in the coil. And this well-known multiplied deflecting power was in common use, in an instrument called a *galvanometer*, for measuring the force of an electric current.

It was also well known, long before the invention of the Electric Telegraph, (known, that is, to scientific men, for all was new to me,) that if an insulated wire were coiled round a piece of soft iron, the passing of an electric current through the wire would cause the iron to attract other iron like a magnet; the attractive force of this *voltaic* or *temporary* magnet, or *electro-magnet*, ceasing with the cessation of the electric current. But to return to the Case.

“ Professor Möncke's experiment was at that time the only one upon the subject that I had seen or heard of. It showed that electric currents, being conveyed by wires to a distance, could be there caused to deflect magnetic needles, and thereby to give signals. It was in a word a hint at the application of electricity to telegraphic purposes; but nothing more, for it provided no means of applying that power to practical uses. His apparatus consisted of two instruments for giving signals by a single needle, placed in different rooms, with a battery belonging to each; copper wires being extended between these two

termini. The signals given were a cross and a straight line, marked on the opposite sides of a disc of card, fixed on a straw; at the end of which a magnetic needle was suspended horizontally in galvanometer coils, by a silk thread. The effect of this arrangement was, that if a current was transmitted from either battery, when the opposite ends of the wires were in connexion with the distant telegraphic apparatus, either the cross would be there exhibited by the motion of the needle one way, or the line by its motion the other way, according to the direction of the current. The apparatus was worked by moving the ends of the wires backwards and forwards between the battery and the coils."

The case then proceeds to describe my first Telegraph, as follows:—

"Within three weeks after the day on which I saw the experiment, I had made, partly at Heidelberg and partly at Frankfort, my first Electric Telegraph, of the galvanometer form, which is now at Berne. It has been written for, and shall be laid before the arbitrators. I used six wires, forming three metallic circuits, and influencing three needles. I worked out every possible permutation and practical combination of the signals given by the three needles, and I thus obtained an alphabet of twenty-six signals. I had invented the instrument which I called the DETECTOR; by means of which injuries to the wires, whether from water, fracture, or contact, are readily traced; an instrument which in practice is never out of my hand, and without which the Electric Telegraph would be impracticable. But my principal improvement was, that my Telegraph did not merely send

signals from one place to another, but that it was, even at that early period, a *reciprocal telegraphic system*, by which a mutual communication could be practically and conveniently carried on between two distant places; the requisite connections and disconnections being formed by pressing the fingers upon keys, and the signals being exhibited to the person sending, as well as to the person receiving, the communication. This improvement was effected by placing a system of keys permanently at each extreme end of the metallic circuit, and by providing each circuit with a cross-piece of metal for completing the continuity of the wires when signals were being received from the opposite terminus. The two signal apparatuses being thus thrown into the course of the metallic circuit, every signal was given at both ends concurrently; and the cross-piece was made to restore the circuit for a reply, on the first communication being completed. This united and reciprocal property is the basis of the Electric Telegraph, and is inseparable from the practical system. It has been my leading principle throughout, and has impressed itself even upon the forms of my instruments; their distinguishing characteristic from first to last being, that my keys and signals have always been joined together into one instrument, and the several instruments into one reciprocal system. In a word, the Arbitrators will here recognize the earliest form of the RECIPROCAL COMMUNICATOR, the fundamental condition of the Electric Telegraph under every varied mode of its operation."

The Alarum is thus described:

"My earliest apparatus thus comprised, in a complete though improvable form, two essential parts of my system

of a Practical Electric Telegraph; viz.: the Detector and the Reciprocal Communicator: a third of equal importance is the ALARUM; without which the Electric Telegraph would require to be constantly watched like ordinary telegraphs.

“Before the end of March 1836, I had invented the Alarum, which is still extant in my first Mechanical Telegraph. It was one of ordinary construction, worked by clockwork mechanism on a removal of a detent. My invention consisted in placing a voltaic magnet in such proximity to an armature of soft iron forming the tail-end of a lever detent, that when an electric current passed round the voltaic magnet, the magnetism which was for the moment excited in it attracted the tail-end of the lever, and by so doing drew its detent-end out of the clockwork; but on the temporary magnetism ceasing with the cessation of the current, the attraction of the tail-end of the lever ceased also, and the detent-end of it was then replaced in the clockwork by a reacting spring or balance weight.”

The origin and principle of the “Mechanical Telegraph,” referred to in the last extract, are explained as follows:—

“The principle of removing a detent by magnetic attraction, and replacing it by mechanical reaction, was not however confined to the Alarum, but on the contrary it was the basis of my Mechanical Telegraph itself. The first idea of it suggested itself to my mind on the 17th March 1836, during my journey from Heidelberg to Frankfort, when reading Mrs. Somerville’s work on the Physical Sciences; and the Arbitrators will find that I immediately afterwards applied the idea to a musical snuff-

box, being almost the only piece of mechanism I was then acquainted with. The striking advantage held out by the mechanical, in comparison with the galvanometer form was, that whereas the mode of giving signals by combinations of magnetic needles, each acted upon directly and separately by an electric current, involved the necessity of using several circuits, and consequently the expense of several wires; on the other hand, if the electric agency could be confined to the office of causing suitable interruptions or divisions in any kind of motion derived from an independent source, the necessity of a plurality of circuits would be avoided, for the diversity of the signals would then depend upon the mechanism."

Though some degree of interest may attach to this, the earliest application of temporary magnetism to exhibit visible signals by letting off clock-work mechanism at a distance (for this mode of signalling, whether to the ear or to the eye, was new in principle when I adopted it) the "Mechanical Telegraph," with all its apparent advantages, and notwithstanding the endeavours of ingenious persons to render it available, has not come into use, to any considerable extent at least, in this country. The visible signals are still given by the deflection of magnetic needles, and the electro-magnet is confined in practice to the Alarum.

The narrative is continued to the beginning of 1837, as follows:—

"During the months of June and July 1836, I employed my leisure moments in working out the details of my

system into a written pamphlet or sketch, which is extant, and the date of which can be clearly proved. The Arbitrators will learn from it that (as early as July 1836) I had, in anticipation, worked out my practical system from the minutest official details, up to the remote and extended ramifications of an important political and commercial engine.

“Towards the end of 1836, my mechanical instrument was nearly completed, and my funds nearly exhausted. Finding it, therefore, necessary either to turn my invention to an immediate profitable result, or to draw upon the resources of my friends, and preferring the former alternative, I obtained an introduction to several of the leading gentlemen connected with the Liverpool and Manchester Railway, and submitted to them, in January 1837, my pamphlet and mechanical instrument, with a view to the practical adoption of the Telegraph in a tunnel for which some mode of conveying signals was required. The correspondence connected with this, my first endeavour to apply the Electric Telegraph to railways, will be laid before the Arbitrators.*

“Before taking my instrument into the North, I showed

* This correspondence included a letter from Dr. Reynolds, of Liverpool, which I print as a contemporaneous expression by a scientific man of the general state of opinion as late as January 1837, many years after the commencement of Mr. Wheatstone's experiments, on the subject of telegraphing by electricity:—

“MY DEAR SIR,

I have examined the papers which you sent to me describing the Electro-Magnetic Telegraph. The Author does not explain the mode in which he proposes to apply this power to effect his purpose. There can be no doubt that electricity, from whatever source it may have been derived, can be transmitted to a distance

it in November 1836 to Dr. Faraday, who kindly called at my lodgings in the Adelphi for the purpose of looking at it, and encouraged me by an assurance that I was right in principle.

however great, by means of a copper wire, in a space of time almost imperceptible. Mr. Wheatstone calculates that it travels at the rate of *four million feet in a second*. The electro-magnetic apparatus possesses many advantages over all other methods with which we are acquainted of affording electricity—it is simple in its construction, not liable to be influenced by states of the atmosphere, or to get out of order. Supposing, therefore, that an isolated wire were extended from Liverpool to London, we might transmit electricity from one place to the other with the greatest rapidity and regularity; but how this power or agency can be applied to communicate signals to the extent required, I cannot conceive; and on this point Mr. Cooke is silent, no doubt intentionally, as in this evidently consists the essence of the invention, and he very naturally must wish to secure some advantage from his discovery, before making it public. He appears to have bestowed much thought and labour on the subject; and some of his contrivances are very ingenious. I was particularly struck with his mode of detecting the defective place, should the wire be broken at any part—it is for this purpose that he makes use of the index or dial given in his book. He appears to me, however, to under-rate the practical difficulties of maintaining a wire extending for many hundred miles, in a state of perfect integrity and electrical isolation; and unless he has two wires of communication, he would, I conceive, be liable to the inconvenience of the parties at each extremity signaling at the same moment of time, and the effect being thus destroyed.

Should you feel any wish to see an electro-magnetic machine, I have one at the Institution, which I should have much pleasure in exhibiting to you.

I am, my dear Sir,

Very truly yours,

WM. M. REYNOLDS.

Bedford Street, 26th January, 1837.

JOS. N. WALKER, Esq., Calderstone.”

“The Directors of the Railway Company thought my instrument, which was calculated to give 60 signals, of too complex a nature for the purpose of conveying a few signals along a tunnel; and therefore proposed that I should arrange one adapted for their purpose. I immediately designed and drew the second form of the mechanical telegraph, which was based upon the same principles as the first, but being calculated to give fewer signals was less complex. I returned to London immediately afterwards, and directed four instruments of the simpler form to be begun; which were soon afterwards made, and are extant. I had two of them working together at the close of April 1837.”

The circumstances under which I consulted Mr. Wheatstone, and the particulars of our earlier interviews, are thus stated:—

“While my four simpler mechanical instruments were being made, I employed myself in trying experiments upon the Electro-magnet, with a view to discover at what distance an electric current would excite the temporary magnetism required for moving the detent of the mechanism. For this purpose, I adjusted above a mile of wire in the chambers of Mr. Lane, in Lincoln’s Inn; but the magnets and battery being ill-proportioned, my experiments were unsatisfactory. In this scientific difficulty I sought the assistance of Dr. Faraday, who advised me to increase the number of the plates of the battery proportionably to the length of the wires; an expedient which in some degree overcame the defects of the magnets. I also consulted Dr. Roget upon the same scientific point; explaining my motives, but without showing my instrument to him.

“Dr. Roget informed me that Professor Wheatstone had a quantity of wire at King's College, which might assist me in trying experiments upon the electro-magnet, and he advised me on that account to submit my difficulty to him. Using Dr. Roget's name as an introduction, I accordingly called the same day upon Professor Wheatstone at his residence in Conduit-street (on the 27th February 1837); on which occasion I asked his advice upon the point which I had before submitted to Dr. Faraday and Dr. Roget. In the course of conversation, Professor Wheatstone intimated that he had long been engaged in experiments himself, to show at what distances signals could be given by electricity, to be applied to telegraphic purposes. Upon his thus introducing the subject of a telegraph, I felt myself bound to caution him that my inquiry had reference to the same object, and that I was about to take out a patent for an Electric Telegraph.

“He politely invited me to King's College, where I found that in connexion with about four miles of wire, he was in the habit of using two galvanometers of different constructions, in his experiments on the effects of electric currents in deflecting magnetic needles. He had no apparatus of any kind for giving signals; but he had two key-boards, one of which was occasionally used in our experiments.

“What he had done towards inventing the Practical Electric Telegraph was confined to the “permutating principle” of his key-boards. This principle, which diminished the requisite number of wires, was engrafted on my Reciprocal Telegraph, and became very valuable in connexion with later improvements; but though diminishing the number of wires, the permutating keys by themselves, and without the later improvements, would have been more

complex than my first galvanometer keys ; for each of the latter gave two signals by a single needle (the plan now adopted on the Blackwall Railway), while the former required the concurrent action of at least two keys and two needles.

“Though Professor Wheatstone was, when I first consulted him, in possession of a valuable principle, he had gone no further. Except in the permutating principle, he was practically behind Möncke; for the latter had an instrument for giving signals, and Mr. Wheatstone had none. Even had all his apparent intentions been worked out, he would not then have fulfilled any of the fundamental conditions of the Practical Electric Telegraph;—the powers of detecting injuries to the wires, by fracture, water or contact; of attracting attention at the commencement of the communication; of sending signals alternately backwards and forwards by the same apparatus; and of exhibiting the signals to the operator, as well as to the recipient. In a word, he had no detector; no alarum; no reciprocal communicator.”

The above mentioned interviews resulted in the formation of a partnership as follows :—

“Eventually, our partnership was formed at Mr. Lane’s Chambers in Lincoln’s Inn, early in May 1837; and Mr. Lane will prove that a very long discussion then took place between Mr. Wheatstone and myself as to money matters, and afterwards a very long discussion as to the priority of names in the patent. Mr. Wheatstone’s own contemporaneous writing proves,

1st, That with his written consent my name took the lead.

2nd, That he paid £80 and I only £50 towards the expense of the patent : and other contemporaneous written evidence will show that any surplus was to be divided, not in these proportions but equally.

3rd, Mr. Wheatstone's own writing also proves that I was allowed £130 for past experiments.

“These are FACTS which cannot be disputed, whatever may be the effect of them. Professor Wheatstone was allowed *nothing* for his experiments ; yet in the recent letter already quoted, he rests his claim to maintain his generally received position, as inventor of the Electric Telegraph, mainly upon the ground, that ‘he alone, unaided, before he was acquainted with me, had carried into effect, *at a very considerable expense compared with his then limited means*, the extensive experiments on which all his subsequent researches have been founded.’ His not having claimed anything for the expensive experiments which he had made before the commencement of our partnership, presents a striking contrast to his conduct at a later period ; when having, in the year 1839, brought a particular series of experiments to a practically useful issue, he asked and obtained an allowance of £100 from the partnership for his expenses in those particular experiments, upon the express ground of the above original allowance to me ; although at the time our legal agreement would have enabled me to refuse him any allowance.”

The circumstances which immediately led to the arbitration are stated in the Case at considerable length. I extract the following passages.

*** “The present arbitration is the immediate offspring of Professor Wheatstone's rejection of a remonstrance admitted to be ‘written with temper,’ made by me to him,

by a letter dated the 20th October last, against a paragraph which was widely circulated in several papers in that month. The paragraph contained an eye-witness's account of certain experiments exhibited by him at Brussels. It was headed, in some papers at least, 'Professor Wheatstone's Electrical Telegraph,' and without once intimating his connexion with a partner, ascribed to him the entire invention. The answer which I received was, that 'of the paragraphs' which had been so widely circulated that even comparative strangers had obtrusively called my attention to them, Professor Wheatstone 'knew nothing; they might be right or they might be wrong; but he had given them no sanction.'

"Some months previously, the fourth Report of the Select Committee on Railways, dated the 2nd July last, was publicly circulated. It was made in the course of an inquiry into those practical questions which had formed my exclusive department. It was made upon Professor Wheatstone's own evidence, some of which was given from information received by him from me, and at a time when he knew that at the request of Mr. Saunders, the Secretary of the Great Western Railway Company, I was waiting at the door of the Committee-room to give evidence if called in. I have no means of showing what his evidence really was, for it was corrected by him with the express view of removing any ground of complaint on my part, and the original notes cannot be obtained while Parliament is not sitting; but even as corrected and printed, the evidence is objectionable. Whatever were the words used by him, it is certain that his evidence conveyed to the mind of the Committee, some of whom were his personal acquaintances and had seen his experiments at King's College, a totally wrong impression, as appears by the following extract from the Report:—

'It appears, that on the Great Western Railway experiments have been made to a considerable extent, with the view of ascertaining the best means of conveying intelligence through the medium of electricity.

'Mr. Wheatstone, Professor of Experimental Philosophy in King's College, has for some years turned his attention to this subject, and has, in conjunction with Mr. Cooke, obtained patents for his inventions. From his evidence, which is especially deserving of notice, it appears that there is no difficulty in conveying intelligence to any part of the island with an almost instantaneous rapidity, by means of a few copper wires and small galvanic batteries. There is great ingenuity in the various modes in which Mr. Wheatstone has applied the power of electricity to alphabetical communication.'

"The impression embodied in the above Report existed at the time Professor Wheatstone gave his evidence, as appears by the first question put to the next witness, C. A. Saunders, Esq. viz. :—

'As the Secretary of the Great Western Railroad Company, can you state to the Committee whether they have adopted Mr. Wheatstone's Magnetic Telegraph?'

*** "About the time the Report of the Committee was made public, an article appeared in 'Chambers' Edinburgh Journal,' of the 25th July last, founded upon experiments which had been exhibited, and explanations which had been given to Mr. Chambers at King's College by Professor Wheatstone; and before the article appeared, Mr. Chambers had written to Mr. Wheatstone, as the latter himself told me, for additional information; but his letter was not answered, because Mr. Wheatstone thought he was going to publish. Here, then, is an article emanating immediately from Mr. Wheatstone's own experiments at King's College, exhibited and explained by himself to the author; an article very widely circulated, expressly upon his own authority, and not until after a written application for fur-

ther information. Surely here I might have expected to find that Mr. Wheatstone gladly availed himself of an easy opportunity of correcting the misapprehensions which have been repeatedly brought under his notice. On perusing an article of four columns, in which my name is not once mentioned, nor the remotest hint given that Mr. Wheatstone has a partner, the Arbitrators will find it stated that he has now made the Electric Telegraph his own; that the first patent was effected by him alone; that he has now superseded it by the third patent, which is also represented to be his alone; that my detector, nay, even my modes of insulating and laying down the wires—my very application (the result of many a disappointment) of iron tubes—the entire invention and every part of it, are all attributed, without exception or qualification, to Mr. Wheatstone alone. * * *

* * * “I felt myself now peremptorily called upon to vindicate, without further delay, my connexion with the invention. * * * I did not charge him with having caused the reports of which I complained; but only brought again and finally under his notice his obligation to correct the mistaken impression, which (from whatever cause it had arisen) certainly existed, and was certainly injurious to me. I made use of the following expressions:—‘Allow me to add, that however your erroneous position may have originated, you yourself become responsible for it when you decline to recede from it. A continued neglect to contradict misstatements which have been circulated in your favour, and by parties receiving their information personally from yourself, can only be construed as a voluntary retention and appropriation to yourself of what you know, and have repeatedly admitted, to belong to another in common with you; nor can it redound to the credit of your liberality if

you sanction, by your silence, even an unauthorized misapplication of your influence in the scientific world to repress and conceal the merits of a comparatively unknown colleague.' ”

I began my extracts with a gentle and friendly remonstrance, addressed to Mr. Wheatstone before the arbitration was resorted to. I will conclude them with a specimen of my later protests against the efforts of his friends to explain away the Award. It is taken from a letter of the 16th January, 1845.

“It is now nearly two years since I remonstrated with you on the endeavours which your friends were making to undermine the award of Sir Isambard Brunel and Mr. Daniell, of April, 1841; but as these remonstrances were met by the assurance of your solicitor (made in your name and by your expressed desire) in his letter of the 20th May, 1843, that there was no truth in the report that you denied your full consent to the declarations contained in the printed paper—an assurance further confirmed by his letter of the 27th June, in these words; ‘Mr. Wheatstone does not desire to escape from a single conclusion which the Award warrants;’—all I could do, was to express myself satisfied with an explanation so unqualified.

“The same cause of complaint has, however, been repeatedly obtruded upon me since. And I now hear from your own lips, that you have absolutely armed yourself with a letter from Mr. Daniell to counteract a certain construction of the Award, which you consider objectionable!

“This is indeed an alarming document to hold in reserve; and how Mr. Daniell could reconcile any such letter with the character of a Judge, remains to be explained.”

I have never been permitted to look at this “alarming document ;” but even if Professor Daniell did express himself incautiously in writing to his friend, no one acquainted with his manly and upright character can suppose that he intended to sanction a clandestine use of his letter to assist Professor Wheatstone’s “escape” (in the words of his solicitor) “from a single conclusion which the Award warrants.”

When Mr. Wheatstone has accounted for the priority of my name in the first patent, and for his own subscription to the Award, I shall be ready to discuss with him, *if he desires it*, our “shares,” “priorities,” and “relative degrees of merit” in the later developements of the invention. Confining myself for the present to the invention which was exhibited to the Arbitrators, and to the words of my original statement respecting it, I pass on to the business arrangements of 1843 and 1845.

Mr. Wheatstone has allowed his friends to speak of the arrangements of 1845, as if, retaining at that time his original half share of the patents, he had received less than half the consideration paid by the Electric Telegraph Company for the purchase of them. There is here what lawyers call a *suppressio veri*; the truth being, that in 1845 Mr. Wheatstone had no share in the patents at all, but only a royalty, which he then parted with at his own price.

His altered position in this respect was the result of the arrangement made in 1843, as already mentioned, by which I took the patents off his hands, releasing a claim which I had against his share, and granting him an ample royalty, without pecuniary responsibility, on all future telegraphs.

This new agreement was embodied in a deed, dated the 12th April, 1843, of which I will state the substance, curtailing legal verbiage.

After reciting the patents and the original partnership agreement, it goes on to say, that "the shares of the said C. Wheatstone in the - - - letters patent are subject to certain claims to a considerable amount, in favour of the said W. F. Cooke, for monies already advanced and paid by him - - - on account of the expenses of obtaining certain of the same letters patent and inrolling the specifications - - - and on other accounts."

Then follows a recital, that "it having been found that the complicated character of the aforesaid arrangements has tended to impede the successful prosecution of the said inventions, it was lately proposed and agreed - - - that all the letters patent, - - - and also all - - - patents for improvements - - - should be absolutely assigned - - - to the said W. F. Cooke; - - - and that in lieu of such interest of the said C. Wheatstone, - - - the said claims now affecting the same should be cancelled, and that there should be secured to him an allowance or royalty, in money, proportioned to the number of

miles over which the said Electric Telegraph should be laid down by the said W. F. Cooke, his executors, administrators or assigns, or by or under licenses from the said W. F. Cooke, his executors, administrators or assigns.”

The deed then “witnesseth” that “the said C. Wheatstone doth - - - assign - - - unto the said W. F. Cooke, his executors, administrators and assigns - - - the several letters patent - - - and all the privileges - - - thereby conferred, - - - and all the - - - shares - - - of him, the said C. Wheatstone, - - - in - - - the - - - letters patent. - - - To the intent that the - - - letters patent - - - may be henceforth the sole property of the said W. F. Cooke, his executors, administrators and assigns - - - during all the residue of the respective terms of years granted by the same letters patent respectively, - - - and - - - during all extensions thereof. - - -

Further on in the deed I am bound, by pages of very stringent clauses, to account every January and July with Mr. Wheatstone for a royalty in his favour, on the operations on the preceding half-year, assessed at the following liberal rates:—

For the first ten miles of Telegraph completed during the

year £20 per mile.

For the second ten miles . . . £19 per mile.

For the third ten miles . . . £18 per mile.

For the fourth ten miles . . . £17 per mile.

For the fifth ten miles . . . £16 per mile.

And for all beyond £15 per mile.

The deed concludes with a release to Mr. Wheatstone of the balance due from him to me.

Passing on to the autumn of 1845, when the formation of the Electric Telegraph Company was in contemplation, Mr. Wheatstone then fixed his own terms for the sale of his royalty, and explained how he arrived at them, by the following letter:—

20, Conduit Street, August 2, 1845.

“MY DEAR SIR,

I have thought over your propositions, and after due consideration have arrived at the following conclusions. I will commute my royalty on *all* lines in England (and Wales) for the sum of £20,000, the royalty on lines completed before the payment of the first instalment of £10,000, to be paid to me under the present arrangement. The grounds of my calculation are these: 1st, that thirteen railway lines, averaging 100 miles each, would realize to me the above sum: 2ndly, that at the rate even at which lines have been completed during the first six months of the present year, the sum I have named would be realized in four, or at the utmost, five years: circumstances may augment or diminish this income, but I consider the chances of increase and decrease equal: 3rdly, that whatever arrangement be made for the sale of the Patents to other parties, the agreement with them cannot affect lines established previous to the date of such agreement.

If the Great Western Railway, and the portion of England south of this line and the Thames be excluded, I would fix the commutation at £16,000.

I will for a further sum of £10,000 give up all my rights in Scotland, Ireland, and Belgium, with all my reserved rights under the English Patents; or I will make

a separate arrangement for any one or more of these privileges.

I wrote by last night's post to Mr. Quetelet, to ask when he leaves Brussels, and when he returns; if it be possible to arrive there a few days before he leaves I will start directly; but it will be of no use for me to be in Belgium when my most influential friend is absent.

Yours faithfully,

C. WHEATSTONE.

To W. F. COOKE, Esq.

P.S.—These propositions to be of no effect unless agreed to within a month from the present date.

C. W."

Some further correspondence took place on points of detail, but the terms themselves were in all points of substance agreed to as at first proposed in Mr. Wheatstone's letter. He received the £30,000 which he asked, together with all arrears of royalty.

But it has been said that the arrangements of 1845 precluded Mr. Wheatstone from continuing his important and meritorious telegraphic experiments. To this I answer, that both the deed of 1843, and the deed of 1845, bound Mr. Wheatstone very properly and reasonably—and bound him by almost the same words at each date—to give to the purchasers of the patents the benefit of all future improvements.

This usual clause, which in fact only sold with the patents a privilege which we have given away gratis, as a matter of course, to every railway com-

pany that has taken a licence, occurs in the deed of 1843, omitting technicalities, as follows—the same form being adopted in the deed of 1845, with a few immaterial verbal differences:—

“The said Charles Wheatstone doth - - - covenant - - - with - - - the said Wm. F. Cooke - - - that if he - - - shall - - - during the - - - terms of any - - - of the - - - scheduled Letters Patent invent - - - any improvement in or addition to the - - - inventions mentioned - - - in the - - - scheduled letters patent - - - although such improvement or addition should have the effect of entirely superseding the - - - original invention - - - provided only that it be applicable to the giving, printing, stamping, or otherwise transmitting of signals, or the sounding of alarums, or the communication of intelligence wholly or partially by means or through the agency of electricity, magnetism, or electromagnetism: In every such case the said Charles Wheatstone will - - - make a full and open disclosure thereof to the said William Fothergill Cooke - - - and will keep the same secret from all other persons - - - And will, upon the request and at the expense of the said W. F. Cooke - - - (the said Charles Wheatstone's expenses - - - being always allowed on a liberal scale) forthwith apply for - - - letters patent - - - in respect of - - - such improvement or addition: And - - - assign - - - such - - - letters patent unto the said William Fothergill Cooke, his executors, administrators, and assigns, as and for his and their absolute property.”

But so far from prohibiting the exercise of Mr. Wheatstone's inventive talents, the promoters of the Electric Telegraph Company especially requested me to engage him as the Company's scientific ad-

viser and assistant, on very liberal terms; and a memorandum to that effect was signed, and for a time acted on.

Mr. Wheatstone, however, soon resigned his appointment, under the following circumstances:—

A Bill for the incorporation of the Company, which was brought into Parliament in the session of 1846, was opposed by Mr. Alexander Bain, who asserted in his petition that he had invented an electric clock, and an electric printing telegraph, and had communicated his inventions confidentially to Mr. Wheatstone, and that the latter had claimed them as his own. The Directors carried their Bill, notwithstanding this opposition, though not without difficulty, through the House of Commons; but Mr. Bain's statement and evidence made such an impression in the House of Lords, that, in the afternoon of the third day of the sitting of the Lords' Committee, the Duke of Beaufort, as Chairman, intimated to the Company's counsel that the Committee were of opinion that the Company ought to make an arrangement with Mr. Bain—hinting, in fact, pretty plainly, that their Bill might be thrown out if they declined to do so. After a consultation with counsel, it was considered necessary to give way. Mr. Bain was accordingly bought off, and became associated with the Company, to the extreme displeasure of Mr. Wheatstone.

About the same time, the Directors unluckily made an agreement with a Mr. Henry Mapple, in

ignorance that this person had a similar controversy with Mr. Wheatstone respecting an improved alarum and a telegraphic rope. As a member of the Board, I know that it was the sincere desire of the Directors to retain the benefit of Mr. Wheatstone's scientific assistance, or at any rate to avoid doing anything which could be personally disagreeable to him ; but in consequence of the untoward circumstances above referred to, he sent in an account of his expenses and retired altogether from the Company's service.

I will assume that he had earned the £30,000 which he took away with him. But, *did he invent the Electric Telegraph?* The Award answers—No ! and my forthcoming volume will show that the answer is not given on insufficient grounds.



PROFESSOR WHEATSTONE'S
ANSWER.*

“THE ELECTRIC TELEGRAPH;
WAS IT INVENTED
BY PROFESSOR WHEATSTONE?”

IN undertaking to reply to the pamphlet bearing the above title, Mr. Wheatstone must disclaim any undue impression that its discussion is entitled to engage public attention. Though he is aware of the interest taken in the Electric Telegraph, he is not solicitous to divert it to his personal exaltation, if he now seeks to perform the duty which every man owes to himself, of vindicating his name from unmerited detraction. He is bound to record his claims, as inventor of this instrument in the form which first made it practically available; for these have been publicly questioned by his former partner Mr. Cooke. At the same time, had he been left to follow his own inclinations, he would certainly not have troubled the world with their differences. He has not cared hitherto to publish a line on these topics, for his position was sufficiently understood and fairly recognized beyond the circle of Mr. Cooke's acquaintance. But as Mr. Cooke has at

* [NOTE.—The *pages* referred to in the margin are those of Part I.; the *sections* referred to are those of the Arbitration Papers, reprinted in Part II.]

length ventured to appeal to a wider tribunal, Mr. Wheatstone is called upon to use the materials he possesses to confute Mr. Cooke's many misrepresentations, and to uphold, as is due to himself, the just verdict of their contemporaries.

Pp. 4 & 273.

Mr. Cooke's disparagement of Mr. Wheatstone's position (see pp. 4 & 5 of his pamphlet) extends to no less than this:—that Mr. Wheatstone became one of the patentees of the first practical electric telegraph, “not from his philosophical information, nor from his experimental ingenuity, but from a communication made to him in confidence by Mr. Cooke, who was then completing the practical invention, and was about to take out a patent for it; who was in possession of practical electric telegraphs, already made by him and *fit* for practical use; who had worked out into a pamphlet* or *sketch* a detailed practical system of electric telegraphing; who was in negotiation with a railway company for the practical application of the invention upon their line; and who, having consulted Mr. Wheatstone as a scientific man, was induced by his scientific acquirements, and by pecuniary considerations, to admit him to a share in the patent as second partner.” This, which is Mr. Cooke's language, with some abbreviations, amounts in substance to a denial of any originative share on the part of Mr. Wheatstone in the first telegraphic

Part II. p. 239.

* No further reference will be made to this pamphlet, as it was never published, nor even its manuscript form exhibited to Mr. Wheatstone

patent, and is consistent with the further allegation on page 9 of the pamphlet, that Mr. Cooke was P. 9. himself “the originator of the practical electric telegraph.” It would be easy to show that this is inconsistent even with former printed admissions of Mr. Cooke,* but it is so far more grossly inconsistent P. 273. with the facts about to be detailed, that this discrepancy is comparatively trivial. Mr. Wheatstone will not only show that the representations of Mr. Cooke are at variance with these facts, but that the facts sustain the position which he has invariably claimed for himself, and which cannot be better stated than in the words of the “Quarterly Review,” to which Mr. Cooke objects, that Mr. Wheatstone was “the first contriver of the electric telegraph in P. 10. the form which made it available for popular use.”

The proofs of this assertion will be given in a few particulars, divested as far as possible of immaterial statements. Before Mr. Wheatstone had the slight- § 516. est knowledge of Mr. Cooke, the subject of telegraphic communication had occupied his thoughts

* It is inconsistent with his *written* admissions, so late as January 7th, 1845; for in a letter to Mr. Wheatstone of that date, he observes:—You reap your most popular reputation from this invention:” (referring to the electric telegraph)—“*for the part you have performed in it, you deserve it!* but it is my belief that I deserve as much for what I have done, *not as a scientific, but as a practical man.*” In a letter of the 20th of October, 1840, he had urged Mr. Wheatstone to put him in a right position with regard to their *joint* invention—“*not indeed as the original projector and leading P. 273, note † inventor, for that I did not ask or desire.*”

[The letter runs thus: “Not indeed as the original projector and leading inventor, for that I did not ask or desire; *but as the inventor, equally and jointly with yourself, standing in point of merit upon precisely the same ground.*”—W. F. C.]

for many years. He had paid great attention to the attainment of this object, by means of electricity, and had made important practical advances, which were already mentioned in print, before Mr. Cooke's introductory visit to him. In the third volume of the 'Magazine of Popular Science' it was stated that:—

P. 152.

“During the month of June, last year (1836), in a course of Lectures delivered at King's College, London, Professor Wheatstone repeated his experiments on the velocity of electricity, which were published in the 'Philosophical Transactions' for 1834, but with an insulated circuit of copper wire, the length of which was now increased to nearly four miles; the thickness of the wire was the $\frac{1}{16}$ th of an inch. When machine electricity was employed, an electrometer placed on any point of the circuit diverged, and whenever the continuity of the circuit was broken, very bright sparks were visible. With a voltaic battery, or with a magneto-electric machine, water was decomposed, the needle of a galvanometer deflected, &c. in the middle of the circuit. But, which has a more direct reference to the subject of our esteemed correspondent's communication from Munich, Professor Wheatstone gave a sketch of the means by which he proposes to convert his apparatus into an electrical telegraph, which, by the aid of a few finger-stops, will instantaneously and distinctly convey communications between the most distant points. These experiments are, we understand, still in progress, and the apparatus, *as it is at present constructed*, is capable of conveying thirty simple signals, which, combined in various manners, will be fully sufficient for the purposes of telegraphic communication.”

It was not till Mr. Wheatstone had reached this stage in his progress to a practical result, which he subsequently attained on the plan thus announced,

that Mr. Cooke introduced himself to Mr. Wheatstone, on the occasion mentioned in page 20 of his pamphlet; and he then came, as he states, “to consult Professor Wheatstone,” by the advice of Dr. Roget, who immediately referred him to Mr. Wheatstone, as to one who was known to be engaged in experiments of this description, and who possessed the means of answering Mr. Cooke’s inquiries.

On that occasion Mr. Wheatstone mentioned, and at another interview he exhibited to Mr. Cooke some of the results he had attained, and communicated to him others which he contemplated: *subsequently* to which Mr. Cooke exhibited to Mr. Wheatstone the instrument he had himself proposed. Mr. Wheatstone saw that Mr. Cooke’s was an inefficient contrivance, which neither in mechanical construction or application of scientific principles fulfilled the conditions required in a practical electric telegraph. This instrument, notwithstanding Mr. Cooke’s statement, had never been practically applied, and was incapable of being-so; while, on the contrary, the instruments Mr. Wheatstone had proposed were all founded on principles which he had previously proved, by decisive experiments, would produce the required effects at great distances. On no occasion during Mr. Wheatstone’s acquaintance with Mr. Cooke and his “practical realities” was Mr. Cooke’s instrument exhibited to him in action, even in a short circuit; it was, after it had been proposed to be inserted in their

P. 152, &
§ 575.

§ 577

§ 581.

§ 45.

See drawing,
p. 155.

P. 183. first patent, omitted as useless, and Mr. Cooke, when he took out the second patent himself, did not think it of sufficient importance to mention it there. Mr. Cooke's "practical realities" were thus tacitly admitted by himself to be abortive, while Mr. Wheatstone's "philosophic toys" were not merely theoretical, but, as the event proved, eminently of a practical nature.

P. 189.

§ 57—67.
 § 131—153.
 § 517—545.

Mr. Cooke's intention was, as he told Mr. Wheatstone at an early stage of their acquaintance, to take out a patent for his invention; Mr. Wheatstone's, when he had finished his experiments, was to publish the results, and then to allow other persons to carry them out in practice. When Mr. Cooke discovered that his instrument was inapplicable to the purpose contemplated, and that Mr. Wheatstone's researches were more likely than his own to be practically useful, he proposed a partnership, and that they should take out a joint patent. Mr. Cooke is of course at liberty to state as he pleases his own inducements for *making* this proposal; but at all events Mr. Wheatstone's sole reason for *accepting* it, was the evident possession on the part of Mr. Cooke of the zeal, ability and perseverance required for a commercial enterprise, and the expression of his intention to devote to it his entire time and energies. Mr. Wheatstone felt confident of overcoming himself all the scientific and mechanical difficulties of the subject, but neither his occupations nor his inclination qualified him for the part which Mr. Cooke undertook to perform. The motives which induced Mr. Wheatstone to associate

himself with Mr. Cooke are more amply stated in his letter (Appendix A.), and any objections he entertained having been removed by Mr. Cooke's representations, the partnership was formed in May 1837, under which they took out, in the June following, as their joint property, the first telegraphic patent.*

The Magnetic Needle Telegraph, which was the principal subject of this Patent, is the instrument on which Mr. Wheatstone relies for a refutation of Mr. Cooke's claim to have participated in his invention; *à fortiori*, to exclude Mr. Cooke's pretensions, as stated in his own phrase, of having been its 'originator.' It was indeed at first agreed between them that their two several instruments should be jointly included in this patent; but during the drawing of the specification, and after the description had been prepared, Mr. Cooke, as has been stated, having become convinced of the inefficiency of his instrument, withdrew its description and the accompanying drawings from the specification, leaving Mr. Wheatstone's to stand alone. In this instrument Mr. Cooke had not the slightest part. This Telegraph† was entirely and exclusively

P. 113.

Answered

§ 131—194.

See heads of agreement, p. 151.

P. 183.

Pp. 170—198.

* The specification of this patent is published in the 'Repertory of Patent Inventions,' Nos. 61 and 62, N. S.

† The electric-magnetic alarm, brought into action by means of a short secondary circuit, which forms a separate part of the first patent, was also an invention of Mr. Wheatstone's; but as Mr. Cooke stated that he himself had proposed to ring a bell by means of an electro-magnet, and also claimed an *independent originality* in the idea of effecting this action by means of a secondary or relay

Mr. Wheatstone's invention, in no respect derived or borrowed from any ideas of Mr. Cooke, or from anything he had done; but designed in pursuance of Mr. Wheatstone's plan which had previously been announced in public. The original suggestion of Ampère, and the idea of placing instruments to act consentaneously and simultaneously at opposite extremities of the line, or the principle of reciprocal communication, which was common to several previous schemes that came to no immediate issue, such as Ronalds', Gauss and Weber's, and Schilling von Canstadt's, were the only principles of the instrument which Mr. Wheatstone derived from anybody. The important principle of his permutating key-board, by which a few wires could be converted into a great number of circuits; the indication of the characters by the convergence of the needles; the employment of vertical astatic needles; the limitation of the motion of the needles to a few degrees by fixed stops placed at the centre of percussion, so that they should point steadily and rapidly to the characters; and the dispensing with

circuit, Mr. Wheatstone has always represented this as a joint invention. It is however the only one which can be considered as having been made in common during the entire period of their association.

Electro-magnetic alarms, in which the detent of machinery was released by the motion of magnetic needles and bars acted on by electric currents, had been previously employed by Gauss and Weber, and by Schilling von Canstadt, in their electric telegraphs. Apparatus had also been set in motion by the attraction of electro-magnets, though not for telegraphic purposes, as no person had succeeded in producing any such effect at considerable distances.

mercurial contracts wherever the circuit was required to be broken or completed, were all points which Mr. Wheatstone had never heard of before, and which he does not believe that any person can contest with him. The result was an original instrument, which, independent of other advantages, presented a far more rapid sequence of signs than had been contemplated in any previous attempt towards an electric telegraph; or, indeed, in any telegraph whatever. A most important point was his application of the theory of Ohm to telegraphic circuits, which enabled him to ascertain the best proportions between the length, thickness, &c., of the multiplying coils, and the other resistances in the circuit, and to determine the number and size of the elements of the battery required to produce the maximum effect. With this law, and its applications, no persons in England who had before occupied themselves with experiments relating to electric telegraphs had been acquainted. To this extent therefore this Magnetic Needle Telegraph was an invention exclusively and entirely Mr. Wheatstone's, and rendered by him complete in all its details; and if, as Mr. Wheatstone has ever freely admitted, he applied in the instances specified principles discovered or developed by a succession of eminent men of science, he is proud to acknowledge his obligations to his true fellow-labourers, but he is at the same time unwilling to resign any portion of what is due to himself, to the confident assumptions of his former partner Mr. Cooke.

Pp. 170—198.

§ 592, & p. 199.

P. 173, note †

§ 524—534. This Magnetic Needle Telegraph is an answer in full to the question Mr. Cooke has raised. It was this—the instrument of Mr. Wheatstone alone, which was employed in the experiments made on the London and Birmingham Railway, for which Mr. Cooke laid down the wires; and it was this instrument, the practical efficiency of which was conclusively demonstrated, as appears by the testimony of the following letters* :—

London and Birmingham Railway, Engineering Department, Camden Station, September 18th, 1837.

“MY DEAR SIR,

P. 158.

I have great pleasure in adding my testimony to that of many others, who have been gratified by witnessing the very beautiful experiments exhibited by yourself and Professor Wheatstone to prove the practicability of transmitting signals by means of electro-magnetic fluid. Nothing can have been more satisfactory than these experiments, which

P. 189.

* This instrument, though not now in operation on telegraphic lines, has not been discontinued on account of its inefficiency; for it is simple in its construction, certain in its action, and rapid in its indication of the letters of the alphabet, which may be read without any difficulty. The sole reason that it is not at present in extensive use is the expense of the conducting wires, which renders it more advisable in a commercial point of view to employ instruments in which one, or two wires at most, are employed, but whose advantages in other respects are not so great. If a telegraph be required for short distances, and for common use, there is none even now that can compete with this. Had the magnetic-needle telegraph been originally brought forward in the form at present adopted, it would have been long before its efficiency as a practical instrument would have been recognized by those influential parties on whose convictions the introduction of the telegraphic system mainly or entirely depended. Professor Daniell himself would not have regarded such an instrument with the enthusiasm expressed in the letter above quoted.

have placed beyond a doubt that the principle may be applied with unerring certainty.

“ I am, dear Sir, yours very truly,

“ CHARLES FOX, Resident Engineer.”

W. F. COOKE, Esq.

“ King’s College, January 16th, 1856.

“ MY DEAR WHEATSTONE,

“ I cannot refrain from expressing to you the P. 158. pleasure I felt at witnessing the complete success of your Electro-Magnetic Telegraph. I am quite surprised at, and almost at a loss to account for, the different effect produced upon my mind by *believing* and *seeing*. I had followed, as you well know, all your experiments from the beginning, and was intimately acquainted with both the principle and construction of your apparatus; but nevertheless, when I saw it in action upon the Birmingham Railroad, I was struck as with something quite new, the facility with which I could myself immediately read signals communicated from a distance; and the simplicity of the means by which I saw you reply to them, and which I felt that I could myself master in five minutes, producing even in me something of the feeling of magic. I received immediate conviction of the possibility of conversing at a distance of 100 miles as quickly as a word can be spelled; and upon cool reflection I now feel satisfied that, not only must the telegraph be adopted upon all railroads immediately, but that it will very speedily be had recourse to upon an extensive scale for private communications between great commercial stations.

“ Sincerely hoping that you will escape the fate of most great inventors, and reap some substantial advantages from your ingenuity and perseverance,

“ I remain, dear Wheatstone,

“ Very faithfully yours,

“ (Signed) J. F. DANIELL.”

TO PROFESSOR WHEATSTONE, &c., &c., &c.

In his agreement with Mr. Cooke, Mr. Wheatstone retained the exclusive right of obtaining Brevets for these inventions in certain countries of the Continent. In pursuance of this he obtained a brevet in Belgium, and in the February following the subject was brought to the notice of the Brussels Academy by Professor Quetelet. After an historical retrospect, M. Quetelet proceeds :—

§ 196.

“ M. Wheatstone fut conduit à son invention par les belles expériences qu’il fit, il y a six ans environ, dans la vue de mesurer la vitesse de transmission de l’électricité et qui furent consignées dans les *Transactions philosophiques* de la société royale de Londres pour 1834. Il trouva que cette vitesse était d’environ 200,000 milles par seconde. Pour faire ces expériences, il n’avait employé qu’un fil conducteur d’un demi-mille ; plus tard, il employa des fils de plusieurs milles de longueur. L’occasion qu’il eut de juger des effets produits par l’électricité voltaïque et par le courant magnéto-électrique sur d’aussi grands circuits, lui donna la conviction que les communications télégraphiques ne devenaient pas seulement possibles, mais très-practicables. Il se mit donc à étudier l’appareil le plus convenable pour réaliser son projet, et il réussit de la manière la plus complète par les procédés suivants :

“ Au moyen de cinq fils conducteurs seulement, entre deux stations éloignées, M. Wheatstone peut indiquer instantanément les différentes lettres de l’alphabet, et les transmettre au nombre d’environ 30 par minute ; plusieurs même peuvent être transmises à deux en même temps. Les même fils servent à la fois pour donner et recevoir des communications sans qu’on doive modifier en rien l’appareil. Au moyen des cinq fils conducteurs agissant sur cinq aiguilles, dont les mouvements se combinent deux à deux, ou trois à trois, M. Wheatstone produit environ deux cents signaux différens.

“ Qu’on se figure deux petites chambres éloignées de

plusieurs milles de distance, et dans chacune un observateur, assis devant un petit instrument qui porte autant de touches qu'il y a de lettres dans l'alphabet. Sur le mur et en face de lui, se trouve suspendu un tableau sur lequel sont lisiblement écrites les lettres de l'alphabet. Quand il met le doigt sur une touche de l'instrument, le caractère qui y répond est distinctement mis en jeu sous ses yeux, et il se manifeste de même pour l'autre observateur dans la station opposée (car la vitesse de l'électricité échappe à toute appréciation). L'appareil sert avec une même facilité la nuit et le jour ; ni les tempêtes, ni les nuages, ni les brouillards ne peuvent empêcher ses indications ; on en a fait l'essai dans toutes ces circonstances.

“ On a établi une ligne télégraphique d'après le nouveau système, sur une distance d'un mille et demi dans la direction du chemin de fer de Londres à Birmingham ; et de plus, des expériences temporaires ont été faites dans lesquelles les fils conducteurs avaient près de vingt milles d'étendue. Les dernières expériences ont été faites conjointement avec M. Cooke, qui sera chargé de tout ce qui concerne les lignes télégraphiques électriques de l'Angleterre. M. Cooke avait lui-même inventé un télégraphe électrique très-ingénieux, mais qui a été remplacé par celui dont nous verons de donner une idée.” * * *

The facts being, as M. Quetelet has here detailed them, Mr. Cooke therefore had no right to call upon Mr. Wheatstone, as in effect he did in his letter dated August 22nd, 1838 (quoted on p. 23 of his pamphlet), to divide with him the credit of Mr. Wheatstone's exclusive invention. If Mr. Wheatstone, previous to the taking out of their first patent, may have used the expression that ‘they should stand *on an equal footing* as inventors,’ he meant solely that, as Pp. 151, 152. was then contemplated, they would each have a

Pp. 151, 152,
& p. 183.

separate invention specified in the patent, without intending to refer to their relative importance. It was far indeed from his intention that Mr. Cooke should suppress his instrument, and then claim to be the joint-inventor of Mr. Wheatstone's. On the other hand, Mr. Wheatstone, and every one else, might be at a loss to understand what Mr. Cooke meant when he claimed to have been "the individual projector of the system." There is no magic in terms, and nothing in such a phrase which could attribute to Mr. Cooke the merit either of the first conception of electric communication, or of devising the instrument by which it was first made popularly available.*

P. 177.

The fallacy of Mr. Cooke, considered simply as a

§ 685—690.

* It may be here mentioned, though a divergence from the main subject, that Mr. Cooke was so unwilling that the merit of the latter should be ascribed to Mr. Wheatstone that he thus acted in disregard of Mr. Wheatstone's rights and feelings. With the view, as Mr. Wheatstone is compelled, though reluctantly, to believe, of justifying the association of his name with Mr. Wheatstone's upon the instruments in question, he made some trifling alterations, by which the simplicity and symmetry of Mr. Wheatstone's arrangement was destroyed, while no advantage whatever was obtained. This done, he placed his name first on all the instruments, giving the erroneous impression to the visitors of the railway that he had not only a share, but the most important share in their invention. What Mr. Wheatstone conceives justifies his view of this transaction is, that although by an express stipulation in their agreement he should have been consulted on any proposed modifications in the instruments, and possessed the right of objecting to such, his opinion on the subject was never asked, and all the instruments for the railway were finished before he knew that any alterations were contemplated. He then expressed his strong disapproval of these alterations; but as great inconveniences and some expense would have been incurred in them, he could do no more.

fallacy, appears to consist in this: that because his instrument included a Reciprocal Communication, and Mr. Wheatstone's included the same, "Mr. Cooke's principle" was the basis of Mr. Wheat- P. 177.
stone's system. This fallacy includes, first, an error in fact, for Mr. Cooke's "principle" was no novelty, having formed part of previous inventions, as has been already stated; and especially having been developed completely and effectively by Mr. Ronalds, in his telegraph, the description of which was published as early as 1823. Secondly, if this had not been the case, it would be inconsequent to P. 180.
assume that Mr. Wheatstone derived this principle from Mr. Cooke, for it could not have escaped the attention of any person engaged on an electric telegraph, if the mechanical arrangements of the instruments had rendered it at all possible. To a mistake in fact, then, combined with a mistaken inference, Mr. Cooke's claim to share the credit of Mr. Wheatstone's invention immediately collapses on the slightest examination.

The collateral arguments of Mr. Cooke in support of this claim are equally susceptible of an easy explanation. In page 35 of his pamphlet, he lays Pp. 151, 152.
eager stress on the fact that his name was permitted in the first patent to precede that of Mr. Wheatstone. To this it may be replied, firstly, that Mr. Cooke had effected this arrangement without Mr. Wheatstone's assent, and that Mr. Wheatstone subsequently expressed his disapproval of the proceeding; secondly, that at the time of applying for the

first patent, Mr. Wheatstone anticipated that Mr. Cooke's instrument would be included in, though it was subsequently omitted from, the specification; and thirdly, that it is not an uncommon practice, where two persons are associated together in a patent, that the party on whom the management of the business devolves should take the lead, without reference to his claims as an inventor. Such was the case in the instance of Boulton and Watt, and others which it would be easy to adduce: but who, on the ground of his name taking the lead in the patent, attributes to Boulton the invention of the steam-engine? Mr. Cooke has insisted on a parallel case which the world has with justice similarly construed.

Pp. 151, 152.
§ 129—194.
§ 546—564.

Pp. 151, 152. Mr. Cooke makes a second point of his statement: that at the outset the partnership account was charged in his favour with £130 for the expenses of his past experiments, without any allowance to Mr. Wheatstone for any past experiments of his. But his statement is incomplete, for the facts were as follows: Mr. Cooke had several instruments which he had been at some expense in constructing, and whatever might have been their presumed utility, he proposed that these should be included in the item of £130, which sum was to be paid out of the future profits of the enterprise. As an inducement to acquiesce in this proposal, Mr. Cooke informed Mr. Wheatstone that a portion of these instruments would be his, and that he might add them to his collection at King's College. The reason Mr.

Wheatstone made no similar demand on Mr. Cooke was this,—that it would have been exceedingly inconvenient on many accounts to have given Mr. Cooke a joint property in the apparatus which Mr. Wheatstone employed for his experiments at King's College.

The inferences which Mr. Cooke deduces from the Award of the arbitrators to whom his claim was submitted will be referred to presently. That Award was made subsequently, not only to the patent already mentioned, but also to the Patent of 1840, which has yet to be described, and of which the following are the important particulars. Mr. Wheatstone, not content with what he had accomplished, but having in the meantime pursued his experiments, had endeavoured, first, to ascertain whether it was possible to construct an efficient telegraph with a single circuit, all preceding efforts to this end having failed. With this object in view, one of his earliest ideas was to adopt the principle of Mr. Ronalds' Chronometric Telegraph; but by substituting a magnetic needle for Mr. Ronalds' electrometer, and by using its double motion to point to letters on two concentric circles, seen through apertures placed before the dial, the number of signals were doubled, while the advantages which current possesses over static electricity for these purposes were obtained. But an instrument thus constructed would still be too limited in the number of signals it could make in a given time, for it would be difficult to obtain more than eight

Pp. 198—203,
& p. 276.

in a minute. After the period of the first patent it occurred to Mr. Wheatstone that either the dial, or a hand pointing to characters on a fixed dial, might be caused to move by the action of the magnetic needle itself. This he succeeded in effecting, and by means of a wheel which alternately inverted the currents, he was able to bring the index or dial almost instantly to indicate any character, so that the limit to the rapid succession of characters was the time required to read them distinctly. On this plan he found that about thirty letters could be read in a minute.

Pp. 198—203,
& p. 276.

About this time, following out the beautiful theory of electric currents established by Professor Ohm, and which at that period was scarcely known in this country, and not sufficiently recognized in his own, Mr. Wheatstone succeeded in constructing electro-magnets possessing power sufficient for delicate movements, and which acted at very considerable distances from the source of the power. He applied the electro-magnets so constructed, in lieu of the magnetic needle, to move a hand or dial, and succeeded in producing the same result as in the former case, by a communicator or wheel, which simply interrupted the current instead of alternately inverting it. He also constructed a modification of this instrument, in which, instead of the hand or dial being impelled into motion by the action of the electro-magnet, an escapement with a maintaining power was employed, by which substitution a greater certainty and regularity of action in some

cases was obtained. His improved electro-magnets enabled him to ring alarms at very considerable distances without the intervention of the secondary circuit which was formerly employed. He also applied a modification of the magneto-electric machine, instead of the voltaic battery, to work the new telegraphic instruments.

It was not till Mr. Wheatstone had completed these instruments, without any assistance from Mr. Cooke, that he showed them to that gentleman. When Mr. Cooke had seen them, it was agreed to by him that Mr. Wheatstone should take out a patent for them for their joint benefit, according to a proviso to that effect in the agreement of November 1837 ; and for some time there was no evidence on the part of Mr. Cooke that he contemplated putting forth the claims he has since done, or that he imagined Mr. Wheatstone's new instruments were founded upon his. He said nothing about any improvements in which he was himself engaged ; while even the letter he wrote subsequently, to which the reader's attention is particularly requested, will show the light in which he regarded the improvements of Mr. Wheatstone, though by this time he had conceived the desire to incorporate what he terms a principle of his own, which without those improvements, he admits to have been of no practical value.

“Sussex Cottage, Slough,
“December 11th, 1839.

“MY DEAR SIR,

Pp. 198—203,
& 276.

“I forward herewith the copy of a drawing, including a principle which I wish to enter in the patent you are about to take out. It is founded on my instrument made in 1836, and requires only your magnet, with your plan of sustaining a constant current to render a working Telegraph of considerable power. If entered in the Patent, your name will of course take the lead, as the inventor of so many valuable improvements; *and indeed of those very points which render the principle alluded to above of practical value.* Your capstan communicator will also be perfectly applicable to my plan of Telegraph.

“The principle is that the cause of motion depends on the cessation of retentive magnetic action, which I understand to be the converse of yours. The advantage is, that, at the minimum distance, where I only require the minimum of attractive or retentive power, I obtain the maximum, and have therefore so much the more power to spare.

“It is understood that you take the specification entirely in your own hands, I supplying my portion, which, for distinction, had better be kept separate, and our drawings on distinct sheets, with our names attached.*

“We will add the following clauses to our general agreement, viz. :—

“1stly. That you will alone furnish the instruments included in your part of the new patent.

* The 1st, 2nd, and 4th sheets of the drawings of the specification of the Patent of 1840 contain Mr. Wheatstone's inventions, the 3rd contains the matter added by Mr. Cooke. Mr. Wheatstone's instruments, and others founded upon them, have been in extensive use on the continent; but Mr. Cooke's have never been employed, and he has published no description of them.

“2ndly. That you will have the option* of fixing your name to the same instruments.

“3rdly. That you will have the sole privilege of disposing of the instruments, and granting licences for their use for private-houses, manufactories and public establishments whether they be applied within the buildings, or to connect lodges, out-houses, &c. with the main buildings or with each other. The application of the telegraph to docks, harbours, fortifications, and railway termini to be under the old arrangement, on the same conditions as the general telegraphic lines.

“As soon as you are prepared, we will try your instruments in any way you wish, on the Great Western and Blackwall lines, and elsewhere as opportunity offers.

“I am, my dear Sir,

“Yours very truly

“W. F. COOKE.”

As to Mr. Wheatstone's improvements, which were to be the main subject of the patent, there is not a word in this letter which indicates any claim, or any impression, even on the part of Mr. Cooke, that they were in any way whatever derived from himself. In the same letter he confirms his consent, previously given, that the new instruments Mr. Wheatstone had shown him, should be called Mr. Wheatstone's instruments, and that his name alone should be engraven upon them. Could there be a more distinct acknowledgement that these were Mr. Wheatstone's exclusive inventions, than

* An agreement was drawn up almost contemporaneously which included among the other stipulations of this letter, the proviso that Mr. Wheatstone was “to have the *right* of placing his name on the new instruments.”

Mr. Cooke's agreement that Mr. Wheatstone's name should alone appear on instruments, which in a pecuniary point of view, were to remain their joint property? This is not like the priority of names in a partnership deed or a patent, an unimportant incident but an unimpeachable demonstration. In a subsequent letter, dated December 16, 1839 (also in Mr. Wheatstone's possession) Mr. Cooke asks Mr. Wheatstone to allow him to make the instruments for the railroads; but in this case also, he adds, Mr. Wheatstone's name *alone* should be placed upon them.

Notwithstanding these admissions of Mr. Cooke, Mr. Wheatstone's title, as the exclusive inventor of his own instruments, was afterwards brought into dispute before arbitrators. Mr. Wheatstone having taken out a Belgian patent, in which he had omitted, as of little importance, the matter introduced by Mr. Cooke, and which, as it was specified separately, according to the proposals in his letters, was rejected without difficulty, Mr. Cooke professed to feel himself aggrieved, that Mr. Wheatstone should speak of his own exclusive instruments (which alone remained) in his own name, and as his own invention. This grievance was wrought into a definite shape in consequence of certain paragraphs which appeared in the English papers. Mr. Wheatstone having proceeded to Brussels for the purpose of receiving a Belgian Brevet for his inventions, exhibited his instruments in action, and his plan of a submarine telegraph, to the principal

scientific men and public authorities of the Belgian capital. Through the kind interest taken in his discoveries by his friend Professor Quetelet, an account of these experiments appeared in the 'Bulletin' of the Brussels Academy* of October 17th, § 196. 1840; and from notices which appeared in the Belgian journals, reports were also transferred, as it appears to some of the English papers. *Inde iræ.*

* "M. Quetelet entretient l'académie des expériences que M. Wheatstone vient de faire à l'observatoire Royal des Bruxelles, au moyen des nouveaux télégraphes de son invention. 'Ces appareils beaucoup plus simples que ceux que M. Wheatstone avait imaginé d'abord, transmettent les signaux avec la rapidité de la pensée, puisque, dans l'espace d'une seconde, ils pourraient faire six à sept fois le tour du globe. D'une autre part, leur volume est si peu considérable, que l'appareil qui donne les signaux, celui qui les reçoit, et la pile galvanique qui fournit la force motrice, peuvent être renfermés sans peine dans une caisse de moins d'un demi-mètre cube; et leur prix ne s'élève pas au-delà de 25 livres sterling. Deux cadrans circulaires, placés aux deux stations extrêmes, et mis en rapport au moyen de deux fils conducteurs isolés, portent les diverses lettres de l'alphabet. En amenant successivement les lettres devant un indicateur, au moyen du cadran d'où partent les signaux, on fait que ces mêmes lettres se reproduisent instantanément devant un indicateur semblable, sur le cadran où les signaux sont reçus. Trente lettres au moins peuvent être transmises par minute, de manière que l'on fait immédiatement la lecture des mots.

" "Lorsque les signaux vont être transmis, on a soin, pour appeler dans la station opposée l'attention des personnes qui doivent faire les lectures, de faire sonner un timbre ou alarme. M. Wheatstone a trouvé au moyen très ingénieux pour faire sonner à volonté, même la cloche la plus forte. Si le fil conducteur vient à rompre, il fait reconnaître, par un appareil très simple, l'endroit où la rupture a eu lieu, lors même que le fil se trouverait caché sous le sol†. Une longue

† This alludes to a process which has not yet been published, while the preceding sentence refers to an entirely new alarm first described in the patent of 1840.

Mr. Cooke was no longer contented with sharing the pecuniary profits of Mr. Wheatstone's inventions, but he wished to participate in Mr. Wheatstone's independent reputation.

§ 196.

On Mr. Wheatstone's return to England, Mr. Cooke addressed to him a letter complaining of "a paragraph which was going the round of the papers, headed 'Professor Wheatstone's Electric Telegraph,' and containing an account of some of his recent experiments in Belgium." He especially objected

expérience lui a fourni toutes les ressources nécessaires pour parer aux inconvénients qui peuvent résulter de l'établissement de ces télégraphes, qui, du reste, fonctionnent déjà en Angleterre depuis plusieurs années, sur des étendues plus ou moins longues de chemin de fer. On sera sans doute charmé d'apprendre que l'auteur a trouvé le moyen de transmettre les signaux entre l'Angleterre et la Belgique, malgré l'obstacle de la mer. Son voyage se rattachait en partie à cette importante opération, qui mettrait l'Angleterre en rapport immédiat avec notre pays, la France, la Hollande, l'Allemagne, et même la Russie.

"Sous le point de vue scientifique, les résultats qu'on peut recueillir des télégraphes électriques de M. Wheatstone sont immenses. Ainsi, pour les localités par où passera la ligne télégraphique, la détermination des longitudes, l'une des opérations les plus délicates de l'astronomie pratique, n'offrira plus la moindre difficulté. D'une autre part, d'après une disposition particulière, une pendule peut donner l'heure à toute une maison, à toute une ville, même à tout un pays: les pendules auxiliaires qui marquent les heures, les minutes, les secondes aux mêmes instants que la pendule régulatrice, ne se composent que d'un simple cadran: aussi M. Wheatstone les nomme squelettes de pendules. L'auteur compte aussi employer ses procédés pour mesurer, avec une précision qu'il croit pouvoir porter à un centième de seconde, la vitesse des projectiles. Il serait difficile de limiter les applications auxquelles se prêteront les ingénieux appareils de M. Wheatstone. Néanmoins l'un des plus beaux titres scientifiques de l'auteur, sera toujours d'avoir mesuré l'incroyable vitesse du fluide électrique qu'il devait employer si heureusement plus tard."

that in the account of these experiments, it was stated that two communicating-wires were employed instead of five, without allusion to the presumed fact that the efficiency of the instruments was therefore wholly dependent on a principle which he had discovered. Thus he raised the claim to regard Mr. Wheatstone's instruments, because they required a single circuit only, as mere improvements on former attempts of his, which he had consigned to oblivion,—a claim which may be said to be quite as unfounded as his pretensions to have invented the reciprocal system. Previous to the date of their first patent, Ronalds', Gauss and Weber's, and subsequently, Steinheil's and Morse's telegraphs all acted in a single circuit; and Mr. Cooke had to vindicate his claim against all these before he could set it up as a bar to Mr. Wheatstone. Nevertheless he stated his intention not to confirm the agreement relating to their new inventions, unless Mr. Wheatstone allowed a recital to the effect—"That his (Mr. W.'s) new instruments were improvements on their § 722. joint invention, and depended fundamentally upon principles first discovered and applied by himself (Mr. C.), and since worked out by each separately in forms essentially distinct." This admission Mr. Wheatstone refused to make, for he could not have made it conscientiously. It would have placed him moreover in the inconsistent position, on the one hand, of having the right to describe his instruments as his sole invention, while, on the other hand, Mr. Cooke would have possessed his legal acknowledg-

ment that they were invented conjointly. Mr. Wheatstone claimed as an indisputable right to call his own researches, discoveries, and inventions his own, and to publish them when and in what manner he thought proper. Yet, as he would not consent to waive this right, Mr. Cooke subjected him to the legal duress of a refusal to confirm this and other exclusive rights which Mr. Cooke had already undertaken to admit by his letter of December 11th.

Refuted by
Mr. Cooke's
Case in the
Arbitration,
§ 129—194.
See also pp.
143—148.

The answer of Mr. Wheatstone to the letter of Mr. Cooke, in which this issue was raised, is printed in the Appendix (Letter A.), and to this the attention of the reader is especially directed. In reply to Mr. Cooke's proposal of an arbitration on the subject of their differences, Mr. Wheatstone, on his part, wrote a second letter, "granting, or rather demanding," the arbitration Mr. Cooke had called for, and requiring that it should be made binding by the proper legal forms. Accordingly an agreement of reference was drawn up, in which the arbitrators were instructed to investigate, and conclusively determine by their written award, in what shares, and with what priorities and relative degrees of merit, the copartners stood in relation to the inventions which formed the subject of the patents, due regard being paid to the original projection thereof, to their scientific development, to their practical introduction, and to the improvements made thereon; and they were empowered either to award simply to the effect that the parties stood

upon equal terms, or that one stood superior to the other, or to enter into details, distinctions and reasons. The consideration of Mr. Wheatstone's separate rights, as they were termed,—the substantial P. 202. subject of the arbitration, was even agreed to be postponed until the relative positions of the parties were defined. The two gentlemen who consented to undertake the office of arbitrators were Sir M. I. Brunel, on the part of Mr. Cooke, and Professor Daniell on the part of Mr. Wheatstone.

It is not immaterial, as an evidence of the animus Pp. 203—212. of Mr. Cooke, to mention the course of conduct which he thereupon adopted. The proceedings had scarcely commenced when it was evident that he intended to carry them on in a most expensive and vexatious manner. In the first place, without consulting Professor Daniell or Mr. Wheatstone, his solicitor took upon himself to engage as third arbi- P. 204. trator, a counsel of great legal eminence, but unacquainted with scientific matters; and this arrangement was only prevented from being carried into effect by the objections of Professor Daniell and P. 205. of Mr. Wheatstone's solicitor. In the next place, after the cases of the parties had been exchanged, Mr. Cooke took upon himself to engage a short-hand writer; and as he appeared to contemplate other expensive proceedings, the arbitrators intimated, according to the statement of Mr. Cooke's solicitor, that they "strongly objected to the course in which Mr. Cooke's case was being brought before them;" in fact, Sir M. I. Brunel himself, in a letter P. 207.

P. 209. to that gentleman, distinctly recorded his disapprobation of the proceedings. The next step of Mr. Cooke was to print *one thousand copies* of a quarto volume containing the two statements, accompanied by an address of his solicitor in reply to Mr. Wheatstone's case, without the fair accompaniment of Mr. Wheatstone's reply to Mr. Cooke's case. This

P. 208. address, when it was presented, was condemned for its form and spirit so strongly by the arbitrators, that they refused to proceed unless it was withdrawn, and the printed papers placed at their disposal. Mr. Cooke's solicitor, indeed, attempted to represent the printing of this volume as required by the arbitrators, but Professor Daniell strenuously repudiated, by letter, having given any, even indirect, sanction to this expensive process; and

Placed at their disposal by a written agreement, printed at p. 160, note †

P. 208. Mr. Cooke's solicitor consequently withdrew the volume.

P. 160, note †.

P. 206. As the case proceeded, Sir M. I. Brunel and Professor Daniell agreed to appoint Dr. Roget as third arbitrator. To this course they had the inducement of Dr. Roget's eminent qualifications in many respects, but especially of his intimate acquaintance with electro-magnetic science; and as he had been mentioned by Mr. Cooke as having been acquainted with his views previous to his introduction to Mr. Wheatstone, there was a more than ordinary propriety in Dr. Roget's selection. Nevertheless, against this appointment Mr. Cooke and his solicitor remonstrated, on the ground "that the question to be tried was *not* a scientific ques-

P. 206.

tion"—a ground inconsistent with the agreement P. 274. of reference to which Mr. Cooke was a party, and grossly—even ridiculously inconsistent with the use which he now attempts to make of the award. As was to be expected, the arbitrators would not admit this remonstrance as offering a sufficient ground to alter their decision, which they were prepared to maintain; but before the appointment of Dr. Roget was definitively settled, Mr. Cooke had made proposals for an “amicable arrangement.” P. 210. The length of time these proceedings had lasted, and their expected protraction in consequence of the course pursued by Mr. Cooke, the great expenses incurred, with the apprehension of Mr. Wheatstone as to his ability to meet them, the anxiety and trouble cast upon the arbitrators, whose time was of the utmost value, and the injury to the interests of the partnership from this prolonged litigation, had altogether a natural influence upon Mr. Wheatstone, and induced him readily to listen to Mr. Cooke’s proposals.

In consequence of these proposals a compromise was effected, and an Award consisting of two documents, to the terms of which both parties previously Pp. 135—148. assented, was signed by the arbitrators. But without laying stress on the obvious fact, that what Mr. Cooke properly terms “a treaty,” was substituted for the independent verdict of the arbitrators themselves, it is important to observe the terms of the Award as agreed upon. It is especially important to observe, that its main practical conclusion, which

P. 148. Mr. Cooke, abstaining from all reference to the document which contained it, quietly, but advisedly, omits from his statement, was altogether in favour of Mr. Wheatstone. That which may properly be called the substance of the Award, and which Mr. Cooke does not venture to face, while he is pursuing its shadow, was to this effect:—That Mr. Wheatstone's "separate privileges," which included the right of putting before the public, *as his own*, the inventions described on the 1st, 2nd and 4th drawings of the specification of the patent of 1840, should be confirmed, and that a proper deed should be executed for the purpose of securing them.*

Printed in Note ‡, p. 160. Pp. 160, 161. The agreement which contained this provision was signed by both the parties and the arbitrators; and it also covenanted that Mr. Cooke's printed papers "should be placed at the disposal of the arbitrators," which was accordingly done; and as Mr. Wheatstone was informed, they were burnt at the Thames Tunnel. It was also agreed that the ex-

* Mr. Cooke had previously proposed, as conditions of the settlement, that Mr. W.'s exclusive privileges should be rescinded, and that the names of Cooke and Wheatstone should appear equally on all the patent instruments; and in compensation thereof the partnership was to pay him £1000 out of the future proceeds. These proposals were rejected; the exclusive privileges were confirmed by the arbitrators, and Mr. W. retained the right to claim his inventions as his own. Mr. Cooke also proposed (letter from Mr. Wilson to Sir M. I. Brunel, April 19, 1841) that he should be nominated by the arbitrators and Prof. Wheatstone as a candidate for election to the Royal Society, stating that if this were not acceded to, he might find it necessary to make some modification in his "concessions." This proposal was indignantly rejected by the arbitrators.

P. 211.

penses of both parties should be paid out of the proceeds, by which the expenses of both Mr. Cooke and Mr. Wheatstone, whatever might be the difference in their amount, were to be borne by Mr. Cooke until the inventions became profitable, which P. 210. at this time they were not. Some other matters of business, which it is not material to mention, were included in this document, which was substantially the Award of the arbitrators.

At the same time Mr. Wheatstone was required to sign the paper which Mr. Cooke has quoted at length, and from which he draws such unwarranted Pp. 139—143. conclusions, whereby Mr. Wheatstone acknowledged Mr. Cooke's position in relation to himself, and to the Electric Telegraph generally. Mr. Wheatstone did, however, object at the time to the wording proposed by Mr. Cooke, as likely to lead to misconception; but as it contained no real discrepancy with his own statements on the same subject, he consented that it should stand. The point which P. 202. Mr. Wheatstone regarded as of primary importance was already gained, and Professor Daniell concurred with him, that having that, he had little to fear from any misrepresentation. As Mr. Cooke, however, places some emphasis on the subsequent acknowledgement of Mr. Wheatstone's solicitor, that his client "does not desire to escape from a single conclusion which the Award warrants," and as Mr. Wheatstone entirely adheres to this acknowledgement, and contentedly accepts all that it does

warrant, he will assist Mr. Cooke in furthering its fair construction.

Thus it states, "that Mr. Cooke is entitled to stand alone;"—(presumably in capitals or italics, if he pleases;) but to stand alone in what capacity?—"as the gentleman to whom this country is indebted for having practically introduced and carried out the Electric Telegraph, as a useful undertaking, promising to be a work of national importance." Mr. Cooke may fairly take an honourable pride in this testimony to his practical discernment and business capacity; and no one will be more willing than Mr. Wheatstone has ever been to acknowledge that in this sense he has been the main-spring to their enterprise. Mr. Cooke is entitled to stand alone, with the assent of the arbitrators, for conceiving, and energetically following up his conception, that the Electric Telegraph might be made a profitable commercial enterprise, and for his having carried out an undertaking of such great importance to the public. His talents and zeal, his experiments, his negotiations, his mechanical and business arrangements, entitle him to stand alone to every intent and purpose which the language of the Award warrants; but they do not sustain his claim on page 9 of his pamphlet to be "the originator of the Electric Telegraph;" nor does the Award carry him one inch in support of this illusion; for it describes him simply as "*originator of the undertaking.*" Originator of the undertaking!

It is the title, in fact, of any one who first plans a steam-ship or promotes a railway; it includes no § 500. pretensions to the invention of steam transit in either case. Mr. Cooke is therefore mistaken if he interprets his designation in any transcendental sense of this sort. He demands, indeed, to be the first of telegraphic inventors, and the Award allows him to be the first of undertakers; and he cannot see, or professes not to see, the distinction.

In the sense of the Award, Mr. Cooke may stand alone (*stat æternumque stabit*), without the slightest complaint from Mr. Wheatstone. “Mr. Wheatstone is acknowledged” in the same document “as the scientific man whose profound and *successful* researches had already prepared the public to receive the Electric Telegraph as a project capable of practical application;” and the rapid progress of this invention is fairly attributed “to the united labours of two gentlemen so well qualified for mutual assistance.” Mr. Wheatstone, however, has laid no particular stress on this testimony, for he has other means of proving by what particular inventions and discoveries, exclusively and purely his own, he is entitled to associate his name with the Electric Telegraph. He is, in fact, preparing an account of the whole series of his operations in this behalf, which he will hereafter lay before the scientific world, as a subject adapted for their special cognizance. If Mr. Cooke will follow his example, P. 169. his merits will be judged by a competent tribunal; and his efforts in this direction would be more

appropriate than his appeal to the promiscuous passengers on the railways of the United Kingdom.

P. 165. But Mr. Cooke, who complains of Mr. Wheatstone's vindication of his proper claims, has already obtained more than his own share of credit, and especially from the document to which reference has just been made. Immediately after it appeared he circulated it extensively, without any allusion to the more important and operative part of the Award, by which it was accompanied. In furtherance of his construction, his solicitor, in a letter to a friend of Mr. Wheatstone, dated May 5, 1843, asserted "that Mr. Cooke was in the right, and Mr. Wheatstone in the wrong;" and that the signing of the statement in question, coupled with the fact of the expenses of the arbitration, "Mr. Cooke's amounting to several hundred pounds," being paid out of the proceeds of the invention, proved that this was the case. To protect himself, therefore, from this summary and unjust conclusion, Mr. Wheatstone wrote to Professor Daniell, to ask him whether the inferences thus put forward were correct. Professor Daniell's letter, which is subjoined, is the "alarming document" of which Mr. Cooke speaks in page 41 of his pamphlet, and of which he appears to feel a salutary apprehension. His question—"how Mr. Daniell could reconcile any such letter with the character of a judge," may be easily answered. Professor Daniell had learnt the unfair construction which Mr. Cooke sought to put upon his judicial act; and in accordance with

P. 165.

See the Letter, p. 162.

P. 167.

the “manly and upright character” which Mr. Cooke allows to him, he performed a necessary incident of his judicial duty. His letter, written to sustain the true and to repel the false interpretation P. 167. of his verdict, may be left, however, to justify itself, at the same time that it will properly conclude this explanation of the relative positions of Messrs. Cooke and Wheatstone.

“King’s College, London, May 24, 1843.

“MY DEAR WHEATSTONE,—

Pp. 168, 169.

“In reply to your note of yesterday, I beg to state that I have a perfect recollection of all the circumstances under which the ‘Statement of Facts’ regarding the Electro-Telegraph was agreed to, and signed by Sir M. Isambard Brunel and myself. You have, not quite correctly, called it an ‘Award’ of the Arbitrators; for, strictly speaking, the arbitration was not proceeded with. The arbitrators, considering the pecuniary interests at stake, and the relative position of the parties in those respects, were of opinion that, without entering into the evidence of the originality of the inventions on either side, a statement of facts might be drawn up, of the principal of which there appeared to be no essential discrepancy in the statement of either party, which might amicably settle the unfortunate misunderstanding which had occurred. It was with a view to promote such an amicable settlement that the arbitrators insisted, as a preliminary step, upon the withdrawal and destruction of 1000 printed copies of an *ex-parte* statement of evidence proposed to be brought forward, and of a most intemperate address prepared by Mr. Cooke’s solicitor. This having been complied with, the ‘Statement’ in question was agreed to, and signed both by the arbitrators and joint-patentees.

“This document makes no assertion whatever as to the originality of the inventions on either side, neither was it necessary nor expedient that it should do so; for, whenever you and Mr. Cooke may think it advisable to publish the details of your several inventions, the scientific public will want no guide in forming their own opinion upon their resemblances, differences and merits.

“Intimately acquainted as I am with the particulars and progress of your own undoubted inventions, I have no hesitation in expressing to you upon paper the opinion which I have always expressed to others, viz., that they are of incomparable beauty and simplicity, and by themselves sufficient to supply all the purposes of the most extended telegraphic communication. I will moreover repeat that which I have already published in my ‘Introduction to Chemical Philosophy,’ viz., that your contrivances would have been of no avail for telegraphic purposes without the investigation which you were the first to make, of the laws of electro-magnets when acted on through great lengths of wire.

“I remain, my dear Wheatstone,

“Ever faithfully yours,

“(Signed) J. F. DANIELL.”

“TO PROFESSOR WHEATSTONE, &c., &c., &c.

P. 162.

§ 198—203.

It is only necessary to add that Mr. Wheatstone has ever been contented with the position thus assigned to him, and which is fairly his due, and that he has never on any occasion sought to detract from the position of Mr. Cooke. In his evidence before the Select Committee on Railways given in February 1840, and of which Mr. Cooke so ungraciously complains, he repeatedly coupled Mr. Cooke's name with his own, as the following extracts testify:—

“297. You have turned your attention for some time to the means of communicating intelligence by means of wires, by electricity?—I have.

“298. You have tried experiments to that effect to a considerable extent, have you not?—I have been engaged in this inquiry for some years past, *and in conjunction with a gentleman, Mr. Cooke, who has turned his attention to the same subject*, I have within that time taken out several patents for the means of effecting this object, and the experiments have since been carried to a considerable extent on the Great Western Railway.

* * * * *

“304. Will you have the goodness to describe to the Committee the mode in which you propose to communicate intelligence between two distant points, as alluded to by you?—I have here a drawing of the specification to the first patent taken out by myself *and Mr. Cooke*. In all essential particulars the instrument here represented resembles the one at the Great Western Railway, &c.

* * * * *

“320. Some arrangements are here represented, to which *Mr. Cooke* has particularly directed his attention; they relate to the means of establishing communications at intermediate parts of the line where no fixed stations exist, &c.

* * * * *

“342. There is one thing I will take the opportunity to mention: I have been confining the attention of the Committee to the telegraph now working on the Great Western Railroad; but having lately occupied myself in carrying into effect numerous improvements which have suggested themselves to me, I have, *conjointly with Mr. Cooke, who has turned his attention greatly to the same subject*, obtained a new patent for a telegraphic arrangement, which I think

will present very great advantages over that which at present exists," &c.

Thus it is difficult to explain in what sense Mr. Cooke has discovered that, "as corrected and printed, this evidence is objectionable;" for it was evidently not so from any disinclination of Mr. Wheatstone to keep Mr. Cooke's name continually before the Committee, the above extracts occurring in the space of four pages. Again, in the "Bulletin" of the Brussels Academy, for which account only of his experiments in that capital Mr. Wheatstone is responsible, so far from never "once intimating his connexion with a partner," Mr. Wheatstone supplied to M. Quetelet materials for the following statement, already mentioned:—"Les dernières expériences ont été faites conjointement avec M. Cooke, qui sera chargé de tout ce qui regarde les lignes télégraphiques de l'Angleterre. M. Cooke avait lui-même inventé un télégraphe électrique *très ingénieux*, mais qui a été remplacé par celui dont nous venons de donner une idée." Mr. Wheatstone is not responsible for every minute statement in the article in Chambers's Journal, though he showed some experiments to the writer; § 197.

§ 204. nor for that in a recent number of the Quarterly Review; nor indeed for any article which has not been submitted to his inspection, or of which he has not himself ascertained the correctness.

P. 134, note*.

While Mr. Wheatstone has on no occasion, that he can call to mind, omitted to make a liberal mention of Mr. Cooke, he might easily, if he had leisure

for such an occupation, collect instances in which Mr. Cooke has not been equally considerate to him. In an article on the Electric Telegraph, also in Chambers's Journal, June 7, 1845, it is stated that, "fortunately for Mr. Cooke, *the inventor, who, with the assistance of Professor Wheatstone, has brought the instrument to its high condition of usefulness, was in the room, and readily explained to the writer not only the nature, but the origin and progress of the invention.*" Mr. Cooke appears to have overlooked Mr. Wheatstone entirely in his communication with Mr. Leithead, author of a work on Electricity which was published as early as 1837.* Even in the eventful year 1854, Prince Menschikoff was not the only person who was parading questionable pretensions at Constantinople. On April 15, Lord Carlisle mentions in his diary that he "called on Lord Stratford, and found with him Mr. Yeames, our consul from Odessa, where he had lived for forty years, and Mr. Cooke, *inventor of the Electric Telegraph.*"

If Mr. Cooke has now, to use his own expression, "the humiliation of retiring from a position, in which he ought never to have allowed himself to be placed," Mr. Wheatstone was willing to have spared

* "On the principle of the action between electric currents moving along conducting wires and magnets, are founded the various contrivances for effecting telegraphic communication. The most complete and successful method is that of Mr. Cooke, through whose polite attention we were favoured with a view of the apparatus, and had the pleasure of witnessing the experiments on the London and Birmingham Railroad."—*Leithead on Electricity*, p. 217. London 1837.

Part II.

Pp. 273—275.

him its publicity. Mr. Cooke has himself obtruded their past differences on the world, and has rendered this reply necessary to Mr. Wheatstone's vindication, and he must submit to hear the answer his attack has elicited. Mr. Cooke proposes further to reprint his *ex parte* volume containing some collateral imputations on Mr. Wheatstone, founded on his own confusion of dates and transactions, and which Mr. Wheatstone may, or may not, think it worth his while to notice. At all events, for the present he is content to leave the question thus. He has independently worked out his own inventions, and he claims the credit of particulars which he can clearly specify. If Mr. Cooke prefers to confound their respective contributions to the Electric Telegraph, the relative value of which the scientific world can estimate, and then, under the name of "originator," "projector," or any other title as sonorous and equivocal, to assume to himself the chief merit of the invention as if it were entire and indivisible, he will indulge in the satisfaction henceforth at his own risk. Mr. Wheatstone will not consent to waive his claims in Mr. Cooke's behalf; and in the statement he has yet to make, will maintain, as he has ever maintained, his title to the definite position conceded to him as "the first contriver of the Electric Telegraph in the form which made it available for popular use." Having thus put his claim on record, with some of the data which substantiate it, he leaves it for the present, without further observation.

And here this pamphlet should have concluded, having exhausted all the relations of Messrs. Cooke and Wheatstone which possess any other than a purely personal interest. But Mr. Cooke has ventured upon a further statement of the pecuniary incidents arising from these inventions, and Mr. Wheatstone to protect himself from its misrepresentations, is himself obliged to disclose the true circumstances of their connection in this respect. Answered, with accounts, pp. 212—262. In doing so he will be under the necessity of publishing matters which are private, but he is satisfied that Mr. Cooke has left him no alternative; he was far from desirous himself of obtruding them on the public; nor is he responsible if, when faithfully stated, they should be found to discredit Mr. Cooke's pretensions, or to convict him of a want of candour in his mode of presenting them.

Mr. Cooke, in his pamphlet, labours to convey the impression that throughout these transactions he treated Mr. Wheatstone with extreme liberality: but of this the reader will judge when he hears all the circumstances. How it came that in respect of patents in which they were at first jointly interested as tenants in common, Mr. Cooke, on the transfer of their respective rights, received for them £150,000, while Mr. Wheatstone, for his share thereof, received only £30,000, will be explained in answer to the professions of Mr. Cooke. Mr. Wheatstone has no doubt that in the approximation to this result the steps which Mr. Cooke took P. 220. were invariably legal. He is further ready to admit

that Mr. Cooke may have felt himself justified in obtaining, if he could, what he modestly termed in his evidence before the Privy Council, “*a margin beyond Professor Wheatstone's*” share in the Patent Rights. But Mr. Wheatstone will not allow it to go uncontradicted that he was treated with liberality by Mr. Cooke, for he was not even treated with the ordinary fairness, which is taken to imply open and candid dealing; and what is more, he was induced by engagements, which Mr. Cooke has never performed, to surrender certain valuable rights beyond the terms originally agreed upon, and to submit to be unjustly fettered in his liberty of invention.

See all the facts, letters, and figures, pp. 212, 262.

The circumstances on which Mr. Wheatstone relies to prove the first of these statements are succinctly as follows. The patents for the first invention were granted for England, and subsequently for Scotland, on the respective dates of June 12th and December 12th, 1837: but on the 18th of November, in the same year, an agreement was entered into by the joint Patentees to regulate their relations, and determine their interest as partners. By this agreement it was covenanted (*inter alia*), that the sole management of the invention should rest with Mr. Cooke, who, at the same time covenanted “to use his utmost endeavour to promote the joint interest of himself and Mr. Wheatstone,” subject of course to discretionary powers as to the degree of attention he should devote to the enterprise. It was agreed that Mr. Cooke might grant

licenses for the use of the invention, and that he might also contract for the absolute sale of the patents, subject to Mr. Wheatstone's consent, as to the amount to be received in either case:—That to remunerate Mr. Cooke for his management, and to reimburse him for the expenses of the same, which he was to incur, and from which he indemnified Mr. Wheatstone, he should be entitled to retain 10 per cent. of all the proceeds which should accrue, and that subject to his per-centage, these should be divided in equal shares between Mr. Cooke and Mr. Wheatstone as tenants in common. At the same time it was agreed by *the fourteenth clause* of the Deed, that Mr. Cooke might contract on his separate account for the works necessary for carrying the invention into effect, but he was strictly prohibited from making such contract a preliminary condition in treating for any license, or for the sale of any interest in the patent rights, and from employing his liberty in this respect so as to lessen or affect the price payable on the latter account. By the eighteenth clause it was provided, that in case of the death or physical incompetence of Mr. Cooke, the management of the invention should devolve upon Mr. Wheatstone, and the covenants in this behalf should be construed conversely. Clauses were added to comprise further inventions, and accordingly between the date of this deed and April 12th, 1843, one additional Scotch and four English patents for improvements, &c. were taken out, and came under its provisions as being also

the joint property of Messrs. Cooke and Wheatstone.

During the same interval the Electric Telegraph was brought into operation on the Blackwall Railway, on the Great Western, from Paddington to Slough, in a tunnel between Edinburgh and Glasgow, and was in preparation on the line between Norwich and Yarmouth. But it was not profitable in a commercial sense during this interval. In the meantime Mr. Cooke paid the expenses of the management, which were proportionately limited in amount by the limits of his operations, while Mr. Wheatstone under a further clause in the above-mentioned deed, contributed half the outlay for law expenses, obtaining patents, &c., and on the other hand bore the chief expenses of his further experiments and inventions. In the negotiations for a new agreement, which was concluded on the 12th of April, 1843, and the nature of which will be described, it was arranged that the accounts between the partners up to this date should be considered as settled, though no statement was furnished by Mr. Cooke, except that it was *greatly* in his favour. It is not material to the principal question, but Mr. Wheatstone has since ascertained either that Mr. Cooke's representation to this effect was inaccurate, or that an item not taken into the account is still due from Mr. Cooke to Mr. Wheatstone.

P. 215.

Abstracted pp.
42—44.

On the 12th of April, 1843, a fresh agreement, as has been already stated, was concluded between

them on Mr. Cooke's proposal. Hitherto they had only ascertained that their enterprise was calculated to become eventually profitable, while it was apprehended by Mr. Cooke that misunderstandings and delays might arise from their joint control over each separate contract. To liberate Mr. Cooke's management from this alleged impediment*, it was therefore agreed that Mr. Wheatstone should assign absolutely to Mr. Cooke all his interest in their patent rights in consideration of a release from all present claims and prospective liabilities, and of a royalty upon all further operations. This royalty was fixed at £20 per mile for the first ten miles laid down in any year, £19 for the second, £18 for the third, £17 for the fourth, £16 for the fifth, and £15 for every mile beyond the first fifty miles. These royalties were to cease with the expiration of the last of the existing patents, but Mr. Wheatstone, on the other hand, was to be entitled to the use of any patents which should be subsequently taken out, and which should be unexpired at the termination of this agreement. A contemporaneous agreement was also signed, which reserved the further right or license to Mr. Wheatstone, to con-

* That no impediment was likely to proceed from Mr. Wheatstone is proved by the letter of Mr. Cooke's solicitor, dated 14th June 1841, to this effect:—Mr. Wheatstone might have caused difficulties by refusing to agree to fair and reasonable prices; but experience has shown that not the slightest difficulty has arisen, or is likely to arise in this respect; Mr. Wheatstone having always, in that important control, fulfilled his trust in a manner as beneficial to the joint concern as it has been gratifying to his partner." (Mr. Wilson to Mr. Richardson.)

struct and employ the patent apparatus in places not exceeding half a mile in distance, &c. for his own separate benefit. These conditions, coupled with the royalties, were at the time considered by Mr. Wheatstone to be a fair equivalent for his moiety in the patent rights, which was subject to the per-centage for management. But indirectly by the operation of the above deed, Mr. Cooke was also freed from the condition which stipulated that he should not be at liberty to make any contracts on his separate account at the expense of the interests of the Patentees; and as the working of this is not immediately obvious, it may be explained by a given instance. Supposing Mr. Cooke, as might easily happen, could contract at a greater profit to himself for a line of fifty miles than for a line of a hundred, he had so far an inducement to elect for the contract which would produce Mr. Wheatstone the lesser amount in royalties. Mr. Cooke, in his evidence before the Privy Council, alleges that his share of the patent rights had been less profitable than his employment as a contractor. That it was so, was due to his possession of these very rights, by which he effectually kept other contractors from competing with him. He might calculate his profits on his contracts or on his patents; it made no difference to him, though it made much to Mr. Wheatstone if Mr. Cooke was induced to contract his operations in the latter respect, by requiring an exorbitant profit on the former. At the same time for the option of shifting

his profits to and fro to either of these sources, as also for his command of the sources themselves, he was solely indebted to this agreement with Mr. Wheatstone.

Mr. Wheatstone, however, is not here complaining of the effect of his own deed, but referring to it solely in answer to Mr. Cooke's pretence of liberality. Mr. Cooke says that he was bound by "very stringent clauses" to account to Mr. Wheatstone for his royalties; but the last clause of the deed provided that if in any case these royalties should be deemed onerous, Mr. Cooke should be "at liberty in honour" to propose to Mr. Wheatstone any modification of them. The terms of the Deed, therefore, were not peculiarly stringent as regards Mr. Cooke, and the event will further show that they were not so remarkably liberal in affording protection to the interests of Mr. Wheatstone.

Between April 1843 and December 1845, the Norwich and Yarmouth Telegraphic Line was completed, together with the following lines which were entirely new: London to Gosport and Southampton, 94 miles; Tunbridge to Maidstone, 15 miles; Euston Square to Camden Town, and Wolverton to Peterborough, 59 miles; together with some other lines of less extent. But the increased estimation of the telegraph was principally owing to its adoption by the Admiralty, which undertook to pay a large annual rent for its use, during a definite term of years, and to its consequent establishment on the South-Western line. Its adoption by the

P. 221.

Admiralty was entirely due to the exertions of Mr. Wheatstone, as was also the successful opening of the telegraph on the Paris and Versailles Railway in 1845, the first established in France, and which was laid down under Mr. Wheatstone's sole direction. To this mention of the facilities indirectly afforded Mr. Cooke in his management, by the independent exertions of his partner with respect to the Admiralty contract, and to the popularity acquired for the invention by Mr. Wheatstone's operations on the Continent, a field in which at that time no other instruments competed with his, it should be added that a new patent, the principal part of which was furnished by Mr. Wheatstone, was taken out on May 6th, 1845, and tended also to increase the value of the invention.

P. 226.

Mr. Wheatstone consequently received in royalties on the operations of 1844, £444, and on those of 1845, £2,775, so rapid was the commercial progress of the electric telegraph. But the account of the latter year was not rendered by Mr. Cooke till after the date of an agreement presently to be mentioned; and before, therefore Mr. Wheatstone was fully cognizant of the increased rate at which profits were accruing, he had parted with his royalties on the terms vaguely described in Mr. Cooke's pamphlet. Mr. Cooke was not indeed scrupulously accurate, when he stated before the Privy Council, with reference to this transaction, that he paid Mr.

P. 223.

Wheatstone in full—" *he never bargained, or anything of the kind;*" for the negotiation which led to

the agreement about to be described, was commenced by a letter from Mr. Cooke dated July the 31st, 1845, and which offered to Mr. Wheatstone for his royalties, &c., at least £10,000 less than Mr. Cooke agreed to give for them subsequently. (See Letter of July 31, 1845*.) Again Mr. Wheatstone is not complaining of this proceeding of Mr. Cooke, which doubtless was legitimate, but is citing it in reply to the assumption of Mr. Cooke, that he took a liberal and gratuitous care of Mr. Wheatstone's interests. It is further mentioned, because it directly contradicts Mr. Cooke's assertion that "he

P. 224.

*

"Kidbrooke, near Blackheath,
July 31st, 1845.

"MY DEAR SIR,

"The proposition I made to you yesterday for the commutation of your Royalty over a large portion of England and Wales may be comprised in the following question:—For what sum paid down now will you commute your Royalty over the whole of England and Wales lying north of the Thames from its mouth to London, and north of the Great Western Railway from London to Bristol, but not including the railway itself, which will remain subject to your Royalty? Say the cash to be paid half within three months, and the remainder within six months more?—I have also to ask you, as a distinct proposition, whether you will accept of the sum of £20,000 as commutation of your Royalty for England, Wales, Scotland and Belgium, and your share in the Irish Patents—and also including the exclusive rights in Great Britain, but not in Belgium,—£10,000 to be paid in four months from this date, and £10,000 six months later?"

"I am, yours faithfully,

"WILLIAM F. COOKE."

"P.S. The latter proposition to include all cash settlements pending between us at the present time. As you are, I believe, connected with others in the 'Exclusive Rights,' you can add £1,500 in addition to the £20,000 on that score."

"CHARLES WHEATSTONE, Esq."

P. 223. never bargained, or anything of the kind," for it shows that he would have possessed himself of Mr. Wheatstone's interests for a considerably lower sum than he eventually paid, if he could have gained Mr. Wheatstone's consent. If Mr. Wheatstone afterwards obtained considerably more, he was not indebted to the generosity of his acting partner, who stipulated for as much as he could for himself, and at the same time gave as little as he could to Mr. Wheatstone.

Pp. 230, 231.

As the letter which proves this has been subjoined, it will not be necessary to dwell further upon this point. On the 4th of October 1845, an agreement was framed by which Mr. Wheatstone undertook to assign to Mr. Cooke his royalties and rights, under the Deed of April 12th, 1843, together with his rights under the license which bore date the day following, and with his interest in the Irish and Belgian patents, in consideration (to speak summarily) of £30,000. The negotiations had arrived at this stage by means of a correspondence between Messrs. Cooke and Wheatstone, from which it appeared that Mr. Cooke was about to transfer both their interests in the patent rights, though he did not think it necessary to communicate to Mr. Wheatstone that the price which he was about to receive for them was £150,000. Mr. Cooke stated, in his evidence before the Privy Council, that Mr. Wheatstone was aware he was selling his patents at a very large sum.* This Mr. Wheatstone

P. 232.

* These proceedings before the Privy Council took place in

denies, for he was kept in the dark as to this im- Pp. 226—228.
 portant incident of Mr. Cooke's operations; and in
 fact Mr. Cooke's expressions only disclosed by de-
 grees his actual relations to Mr. Wheatstone; and
 whereas they represented him at first as merely an
 agent between Mr. Wheatstone and an unknown
 company (see his letter of September 15, 1845*), P. 229.
 he was subsequently presented as the intended
 assignee of Mr. Wheatstone's rights under the con-
 veyance (see letter of his Solicitors, 27th of Sep-

February 1851, on the occasion of the application of the Telegraph
 Company for an extension of the term of the first patent. In another
 portion of his evidence Mr. Cooke says, "I have no doubt Professor
 Wheatstone knew to a certain extent, I do not think he did in full, P. 229.
 but about the amount I was to receive."

* "1, Copthall Buildings,
 September 15th, 1845.

"MY DEAR SIR,

"I have received an order for the Dover line, a circumstance
 very much in favour of the immediate formation of a Telegraphic
 Company. As I have not received your answer to a letter written
 last week, I conclude you are from home, and probably still on the
 Continent. I will therefore briefly repeat the substance. The
 arrangements I am making for the sale of the Patents are not suffi-
 ciently advanced to admit of their being completed by the 4th
 October, the day to which you limited me in your letter of (or about)
 the 4th August.

"Before I commit myself so far, I require your consent to the
 extension of the period *for which you have given me powers for the*
sale of your Royalty in England and Wales, or in part. This period
 ought to be extended at least to the 15th November, when the com-
 mercial world will again be assembled in town, &c.

- "Yours truly,

"WILLIAM F. COOKE."

"PROFESSOR WHEATSTONE."

P. 229.

tember 1845*), and, eventually, as part purchaser on his own account (see his letter of the 11th of December 1845†), a position still less compatible with that of agent for Mr. Wheatstone. In this

*

“ 1, Copthall Buildings,
September 27th, 1845.

“ DEAR SIR,

“ Herewith we hand you for perusal the draft of an agreement relative to *Mr. Cooke's proposed purchase of your interest*. We understand the terms to be—£20,000 for England, £5,000 for Scotland, £5,000 for Ireland, Scotland and Belgium. England to be determined on (with or without Scotland) by the 15th November, and Ireland, &c. by January, *if* the English arrangement is fixed by a day [qu. what day?] in October—otherwise to be off. We should be glad to hear from you soon in this matter, as Mr. Cooke expects his friends in town next week.

“ Yours faithfully,

“ WILSON AND HARRISON.”

“ PROFESSOR WHEATSTONE.”

†

“ 1, Copthall Buildings,
December 11, 1845.

“ *Cooke and Wheatstone.*

“ DEAR SIRS,

“ There will not, we hope, be any objection to complete the release in this matter at once even in Mr. Richardson's absence. He has, we believe, completely approved of the draft, having given us authority to engross it; and indeed it is a merely formal thing as to which there can be no question. We propose to give Mr. Wheatstone, on his executing the release, Mr. Cooke's promissory note at ten days' for the balance (on the Royalty account), say £1,624 11s. 1d. Our object in proposing this arrangement is that the release is part of Mr. Cooke's title, and that his pending arrangements are delayed by the want of it—and the ten days' credit are requested in order to enable Mr. Cooke to put himself in funds by completing his sale *to his new partner*. Requesting the favour of your earliest attention to this matter,

“ We remain, dear Sirs,

“ Yours, very truly,

“ WILSON AND HARRISON.”

“ MESSRS. RICHARDSON AND TALBOT.”

respect, therefore, there was not that explicit dealing on the part of Mr. Cooke which Mr. Wheatstone's relations with him might have led him to anticipate.

To return to the substance of the agreement. If the above terms had been carried into effect as framed, without some additions which it will be most material to mention, even then the result would have stood thus:—that Mr. Wheatstone would have received a fifth of the price which Mr. Cooke received for their interest in an enterprise in which their shares were originally equal; in other words, that Mr. Cooke's '*margin*,' of which he spoke with such a happy vagueness before the Privy Council, would have been £90,000. It might Pp. 232—240. astonish the Privy Council, and perplex Mr. Cooke, to account for the grounds of this singular discrepancy. It could not have been, as he stated, that part of the consideration for his £150,000 consisted of his interests independent of the patent rights, as for independent speculations in which he had engaged he received an additional £10,000, as appeared by the evidence of Mr. Barwis the accountant,* and for stores in hand belonging to him a credit of £2,564 1s. in the Company's books. He himself admitted on his examination that it appeared from the deed by which the patents were assigned

* It was £160,000 that he (Mr. Cooke) received credit for in the books of the Company, which seems to have been £10,000 as for work done by Mr. Cooke previously, and £150,000 *was for patent P. 232. right, as stated in the books.—Evidence of Mr. Barwis before the Privy Council.*

P. 239.

that they were the sole consideration; and even if he had chosen to blend them with his interests as a contractor, it is immaterial if, as we have shown, the value of his business as such was derived principally from his possession of the patents. It is to no purpose that he further excuses the disproportion by stating that the patents were his *speculative* property. Their value had been fairly tested; and if he chose to lay down certain lines, partly with his own capital, he did so safely and with the certainty of profit. If he confined himself, on the other hand, to his legitimate business as a contractor, it was in no sense more speculative than the royalties of Mr. Wheatstone. Both were speculative, in as far as the income arising from either might be indefinitely increased with the increase of operations. But the risk was none if Mr. Cooke confined himself to contracts at definite and remunerative prices, and there was no lack of these, or of a very ample 'margin,' after payment of all the royalties due to Mr. Wheatstone. There was no *speculation* at all events in the payment to Mr. Wheatstone of a sum which Mr. Cooke had previously received for that purpose from the same parties from whom he received so much larger a payment for himself. To sum up the facts of this part of the case, it appears that if the patents had been sold in April 1843, Mr. Wheatstone and Mr. Cooke must have divided the proceeds. Had Mr. Cooke subsequently sold the patents subject to Mr. Wheatstone's royalties (and he was not empowered to sell them otherwise

Answered
with exact cal-
culations, and
with all the
letters and
figures, pp.
212—262.

without making a fresh agreement with Mr. Wheatstone), the latter would have acquired by the end of 1853 upwards of £70,000. If, therefore, instead of anything approaching this sum, he received £30,000, which Mr. Cooke obtained for him from the same parties from whom he himself obtained four times that amount, Mr. Wheatstone apparently had reason to regret a circumstance, stated in his letter to Mr. P. 243. Cooke of September 17th, 1845, that on account of the ill-health of his solicitor he had been unable to consult him for a year, which included the time during which Mr. Cooke was negotiating the substance of the terms acceded to. For the deprivation of this protection Mr. Wheatstone is of course aware that Mr. Cooke is not answerable, nor does he on this part of the case set up any claim or complaint against him; he relies on this evidence solely to rebut the suggestion that he was treated with unnecessary candour, or that he was indebted in any sense to Mr. Cooke's *liberality*.

The circumstances which follow are, however, adduced to sustain such a claim and complaint as is mentioned; and though both have been already stated on page 38, they will become more defined in the process of narration. On October 17th, 1845, P. 241—262. Mr. Wheatstone received notice from Mr. Cooke's solicitor that Mr. Cooke would ratify the conditional agreement of October 4th. At this date the royalties and rights of Mr. Wheatstone, under the deed of April 1843, were alone included in the agreement above-mentioned. In December 1845 the necessary

P. 241. deeds of transfer, in pursuance of this agreement, were executed; but in these were included assignments to Mr. Cooke, of past and future patents for England and Wales, to a further extent than was contemplated in the agreement of October. These assignments had, in fact, the following operation. Whereas the payment of Mr. Wheatstone's royalties would have ceased in 1856, the date of the expiration of the sixth English patent (provided it was not renewed), and these royalties were alone included in the agreement of October, all patents already existing which should not have expired in

P. 244. 1856 would have remained the joint property of Messrs. Cooke and Wheatstone, but for these additional assignments of December. By these they became the unconditional property of Mr. Cooke; and, what is of still greater consequence, Mr. Wheatstone was simultaneously bound to communicate and assign to Mr. Cooke all his future improvements on these patents, until the year 1859, the last of which did not expire, without any pecuniary or other consideration.* Of course this engagement

* By this agreement Mr. Wheatstone was bound to communicate to Mr. Cooke every future improvement he might make or become possessed of, on any of the inventions included in the several patents respectively, during the terms for which they were granted, or during any extension thereof; provision only being made for repayment of the expenses of obtaining the new letters patent, but none being made for defraying the costs of the experiments. It is true that, as Mr. Cooke states, the same provision existed in the agreement of 1843, but the cases were totally dissimilar; in the latter Mr. Wheatstone had a direct pecuniary interest in increasing the subsequent value of the inventions, in the other he had none; and he certainly would

must not be taken to imply that Mr. Wheatstone made Mr. Cooke a supplementary present of all his existing and prospective property in the creations of P. 244. his skill, but that a consideration for this had already passed, or been assured to him. This consideration, though not described as the equivalent for the rights subsequently transferred by Mr. Wheatstone, had in fact been expressed in a memorandum signed by Messrs. Cooke and Wheatstone, and dated a day previous to their provisional agreement of October 1845. The following is a copy :—

“It is understood that Mr. Wheatstone will take the P. 249. Chair of a Committee of three, to take charge of the manufacture of the patent Telegraphic instruments, and the taking out and specifying future patents, and matters of the like nature, at a salary of £700 a year, and shall devote to such objects what time he shall think necessary. It is also understood that a patent shall be applied for immediately to secure Mr. Wheatstone’s improvements in the mode of transmitting electricity across the water ; that Mr. Wheatstone shall superintend the trial of his plans between Gosport and Portsmouth ; and if these experiments prove successful, then in the practical application of the improvements to the purpose of establishing a telegraph between England and France ; the terms on which such Telegraph is to be held being a matter of arrangement between the proprietors of the English and French Patents. *These terms are under-*

have insisted on a clause that he should be compensated for the expense of such experiments, from which he would derive no pecuniary advantage, had he not been convinced that this object was effectually secured by the simultaneous undertaking of Mr. Cooke set forth above.

stood as a part of Mr. Cooke's plans for disposing of the patents to a Company.

“(Signed) WILLIAM F. COOKE,
C. WHEATSTONE.”

“1, Copthall Buildings, London,
3rd October, 1845.”

P. 250—262.

This memorandum then was the further consideration from Mr. Cooke for the further assignments of Mr. Wheatstone, and as such it was tacitly regarded by the latter. It was subsequently referred to, and its obligations admitted by Mr. Cooke in his correspondence with Mr. Wheatstone. In a letter dated December 13th, 1845, Mr. Cooke says, “I hope we shall get into our new offices and workshops before Christmas. We will then carry out our own manufactory, and call you to our councils.” Again, on January 14th, 1846, he writes, “Will you meet me here at four o'clock to-morrow? I wish to introduce you to Mr. Ricardo, who will be here at that time, that we may arrange about your position with us as scientific adviser. Mr. Ricardo has from the first been acquainted with, and approved of, my agreement with you.” To this Mr. Wheatstone has now to add, that this agreement was never fulfilled; that he was never appointed Scientific Adviser to the Company; that he has not up to this moment received one sixpence as consideration for the additional rights assigned, or as compensation for the disabilities to which he submitted himself solely in consideration of Mr. Cooke's undertaking.

Mr. Cooke's explanation of the non-fulfilment of

his engagement, or rather his implied assertion of its complete fulfilment, is, however, scarcely less extraordinary than the position to which it so unhand-
somerly consigned Mr. Wheatstone. He states in effect that Mr. Wheatstone relinquished as his P. 250—262.
voluntary act, and without compensation, an assured income of £700 a-year, with every means of pursuing his experiments, without expense to himself, because he disapproved of certain connections the Company had formed. So far from this being even in a literal sense true, it is simply impossible that Mr. Wheatstone could have relinquished what he never possessed. He was never recognised in the capacity of the Company's scientific adviser; he never attended any Committee Meeting, or was consulted respecting the taking out of patents by or for the Company; he never received any salary or remuneration in respect of personal services; and, to repeat his statement summarily, his appointment was never resigned, and could not have been resigned, because it was never confirmed, or even offered for his acceptance. If Mr. Cooke's implied and direct statements to the contrary had been true, there would certainly be some entries in the Company's books to corroborate them, and to the production of these Mr. Cooke is invited. (See for a direct contradiction the letters of Mr. Ricardo and Mr. Wheatstone, Appendix B, the statements of the former gentleman being at complete variance with the positive assertions of Mr. Cooke). On the other hand, Mr. Cooke's assertions are in substance, as well as in the

letter, a misrepresentation of all that occurred; and if a bold, at the same time a most vain, attempt to shift the responsibility for the breach of his engagement. It appeared that when the Company had formed the new connexions to which Mr. Cooke alludes, there was no longer any disposition to confirm his undertaking. Mr. Cooke himself informed Mr. Wheatstone a short time after that occurrence, that the Directors objected to his appointment *on account of the expense*; nor from that time could he obtain either from Mr. Cooke or from his solicitor any explanation with respect to the fulfilment of the agreement, or of the way in which it was to be interpreted. Mr. Wheatstone, it is true, was invited to take shares in the Company, and thus qualify himself to become *a Director*, which for various reasons he declined; but he did not, nor was disposed to decline the post of Scientific Adviser, had it been offered to him in pursuance of the agreement.

P. 250—262. It is true enough that, as Mr. Cooke avers, “the memorandum was *for a time acted on* ;” for it was acted on by Mr. Wheatstone on the assumption that it would be confirmed, and, as it proved, at Mr. Wheatstone's expense. Mr. Wheatstone gave in fact considerable time and attention to the objects therein contemplated; and afforded all the assistance that was required of him by the Company in the preparation of telegraphic instruments, and in their Parliamentary and legal proceedings. He also made, in accordance with the second paragraph of the said memorandum, an extensive series of ex-

periments on methods of insulating conducting wires for the purpose of crossing the sea ; and he was preparing the specification of a new Patent for the improvements effected, when his efforts were frustrated by the Company themselves, through a proceeding which was in any event unjust to Mr. Wheatstone, but which was *obviously* derogatory and grossly inconsistent with the position which Mr. Cooke assumes to have been accorded to him.

Mr. Cooke's version of this transaction is, as Pp. 261, 262. usual, inaccurate, for he states that Mr. Wheatstone had a controversy with a Mr. Mapple respecting a telegraphic rope, when the relations of Mr. Wheatstone to Mr. Mapple were simply as follows :—As Mr. Wheatstone was preparing his various plans for the manufacture of the Submarine Telegraphic Line, finding himself in want of a small portion for an immediate experiment, he engaged Mr. Mapple, who was at that time employed by him in the construction of various instruments, to make by hand the requisite quantity. Mr. Wheatstone was about to leave town to superintend some experiments at Portsmouth, when the Company's Engineer expressed a wish to have a quantity of the same material for a special purpose, and as he also was indisposed to wait till the arrangements were completed by which it might be manufactured more perfectly and cheaply, Mr. Wheatstone placed Mr. Mapple at his disposal to execute his orders. On Mr. Wheatstone's return to town he was therefore unprepared to learn that the Company, without

consulting him, or giving him the slightest intimation of their intention, had arranged with Mr. Mapple to take out a patent for some supposed improvements which he had made while executing Mr. Wheatstone's orders. When Mr. Wheatstone expressed to Mr. Cooke his surprise at this proceeding, no explanation was offered, and no wish was expressed on the part of the Company, or of Mr. Cooke, that his experiments should be continued. (See note, Appendix D.) From these circumstances, combined with others, it was obvious that there was no intention on the part of the Company to fulfil Mr. Cooke's engagement. All the satisfaction obtained by Mr. Wheatstone was, that the sums expended by him for labour and materials were repaid.

It may be that Mr. Wheatstone has still a legal remedy for the pecuniary loss which in consequence he sustained. But a further injury he incurred, may not be so directly susceptible of redress. As Mr. Cooke took no steps to obtain the confirmation of his own agreement, Mr. Wheatstone was obliged to desist from proceeding with his operations. The Company ignored the claims of Mr. Wheatstone, whilst the restrictions which accompanied them remained to fetter him. Not only was he deprived of the assistance, in his experiments, which he calculated on obtaining from the Company's co-operation; but he was obliged to make them at his own cost, if he made them at all, to the entire and exclusive advantage of the Company. It is therefore that Mr. Wheatstone may fairly complain

that the exercise of any inventive faculties he might possess was effectually prohibited. He was condemned to the alternative of suspending his labours, or of handing over their fruits to others not only without recompense, but at an absolute loss to himself. By the fetters in which he was retained he was precluded from aiding in the development of the invention with which his name is identified; and for some of the best years of his life he was rigorously reduced, with respect to this important object, to a tedious and comparatively sterile inactivity. Mr. Cooke is welcome, if he pleases, to take as he does a trivial view of this predicament. He would not seem pre-eminently qualified to estimate the measure of Mr. Wheatstone's disabilities, if, with the resources of a powerful establishment at his command, with every inducement to proceed, and with no restrictions to deter him, he has not during the same interval, that Mr. Wheatstone is aware of, contributed a single addition to scientific knowledge, or to the apparatus and practical application of the Electric Telegraph. Mr. Wheatstone, on the other hand, may offer proofs hereafter of what he might have done, had he not been so circumstanced. In the meantime no one in connexion with the Company has shown the slightest interest in developing his various improvements, many of which have never even been made public. In fact, no one has been, or could be benefited by the narrow policy which persists in retaining valuable instruments in their present stage of incompleteness, and which arrests,

as far as possible, the progress of invention. Be Mr. Wheatstone's claims to consideration what they may, it should not be lost sight of that the public were entitled to the best services he could render, and that these have been suppressed simultaneously with the injury he has himself sustained by Mr. Cooke's proceedings. Mr. Cooke must, however, meet this and all other responsibilities arising from his arrangements in the best way he may be able: Mr. Wheatstone will not waive his legal claims in this behalf; while at the same time he trusts that, with respect to Mr. Cooke's pamphlet, this narrative of the facts which have been there misrepresented will be deemed as sufficient as he believes it was necessary.

APPENDIX.

APPENDIX A.

“ 20, Conduit Street, October 26th, 1840.

“ MY DEAR SIR,

“ Of the paragraphs you refer to I know nothing ; they may be right or they may be wrong, but I have given them no sanction. I am, however, glad that they have afforded me the opportunity of being informed clearly in writing what is your opinion of our present position, for I assure you I have not been able to ascertain it from the conversations which have passed between us. Your statement, though erroneous in many particulars, partly from being influenced by your feelings, and partly from your looking only at one side of the question, is yet written with temper, and I will endeavour to reply to it in the same spirit. I hope that the answers I shall give and the explanations I shall make, will enable us in future to understand each other better.

“ Firstly, you state that ‘ you alone had succeeded in reducing to practical usefulness the Electric Telegraph at the time you sought my assistance.’ Now this I wholly deny ; it is utterly at variance with the facts. Your instrument, however ingenious in its mechanical arrangements, had never been practically applied, and was incapable of being so. On the contrary, the instruments I had proposed were all founded on principles, which I had previously proved by decisive experiments would produce the required effects at great distances.

“ With respect to your statement that I employed myself at your request in perfecting your invention in detail, it is equally erroneous. My time, so far as it was devoted to

Answered throughout by the arbitration papers ; which led to the award of Sir I. Brunel and Prof. Daniell, p. 14.

§ 1—46.

See a drawing of these instruments, p. 155.

telegraphic researches, even after I became acquainted with you, was exclusively occupied in perfecting my own instrument, which had nothing in common with yours, and in which I was not only known to be engaged by all my scientific friends, but which was even announced in public print before I knew of your existence. I confined myself to carrying out one of my own inventions for two reasons; first, because my experiments led me to believe that the motions of a needle could be produced at distances at which no effects of electro-magnetic attraction could be obtained; Pp. 170—198. and secondly, I did not wish to interfere with you. With regard to the subsequent development of my first telegraph, the essential principles of which are the formation of numerous circuits from a few wires, and the indication of characters by the convergence of needles, I am indebted to no person whatever; it is in all its parts entirely and exclusively my own. The modifications which you introduced, without consulting me, in the instruments for the Great § 678—690. Western Railway, I consider as altering the simplicity and elegance of the arrangement, without introducing the slightest advantage, and I certainly should not recognise them in any published description.

“The subject of telegraphic communication has for a long series of years engrossed my thoughts. When I made in 1823 my important discovery, that sounds of all kinds might be transmitted perfectly and powerfully through solid wires, and reproduced in distant places, I thought that I had the most efficient and economical means of establishing a telegraphic (or rather a telephonic) communication between two remote points that could be thought of. My ideas respecting establishing a communication of this kind between London and Edinburgh, you will find in the ‘Journal of the Royal Institution’ for 1828. Experiments on a larger scale, however, showed me that the velocity of sound was not sufficient to overcome the resist-

ances and enable it to be transmitted efficiently through long lengths of wire. I then turned my attention to the employment of electricity as the communicating agent; the experiments of Ronalds and others had failed to produce any impression on the scientific world; this want of confidence resulted from the imperfect knowledge we possessed of the velocity and other properties of electricity; some philosophers made it a few miles per second, others considered it to be infinite; if the former were true, there would not be much room for hope; but if the velocity could be proved to be very great, there would be encouragement to proceed. I undertook the inquiry, and with the result the whole scientific world is acquainted. At the same time I ascertained that magnetic needles might be deflected, water decomposed, induction sparks produced, &c., through greater lengths of wire than had yet been experimented upon. In the following year, at the request of the Royal Society, I repeated these experiments with several miles of insulated wire, and the results were witnessed by the most eminent philosophers of Europe and America. I ascertained experimentally (which had never been done before) many of the conditions necessary for the production of the various magnetic, mechanical, and chemical effects in very long circuits; and I devised a variety of instruments by which telegraphic communication should be realized on these principles.

“The real particulars of the circumstances under which your name was allowed to take the lead in the British patents have escaped your memory: I will endeavour to recall them to you. When you first proposed a partnership, you know how strongly I opposed it, and on what grounds I did so. I said that I felt myself perfectly confident of being able to carry out my views to the ends I anticipated; that I fully intended to do so, to publish the results, and then to allow any person to carry them into

§ 129--194,
pp. 148--152.

practical effect. I told you, that while I admired the ingenuity of your contrivance, I had no opinion whatever of its applicability to the purpose proposed; and I urged that, in the position in which I stood, to associate my name with that of any other person, would diminish the credit which I should obtain by publishing separately the result of my researches. To this you replied, that you were not seeking scientific reputation, that no difference could arise between us on this account, and that your sole object was to carry the project into execution, so that it should produce a profitable result. These and other matters having been concluded, it was finally arranged that a patent should be taken out in our joint names, which should include our two separate instruments. When we met to settle the preliminaries of the English patent, I was much surprised with the claim you put forward to have your name inserted first. I considered that, as we put ourselves on an equality, by contributing each an invention, to allow my name, which was well known, to follow yours, which was then totally unknown, might be construed into my admitting that your share was greatly superior to mine. You urged that your pecuniary obligations were greater than mine; that as I intended to leave all negotiations with you, your authority would be less respected if your name appeared second, and that your invention was more valuable than mine (an assumption which I did not admit, as I considered, what the result confirmed, mine to hold out the greatest promise of success). After some discussion, it was finally agreed that my name and yours should stand alternately first in all succeeding patents. Some time after this we met to arrange the preliminaries of the Scotch patent; you had already prepared the declaration. On reading it over I was surprised, after what had passed, to find that your name was placed first; I objected to this as contrary to

§ 57—67, &
§ 546—559.

§ 154—164.

our previous understanding. You said it had been done without your knowledge, but you objected to having it altered, on account of the delay it would occasion. After some discussion we came to a new arrangement; on my allowing that your name should stand in the British patents, mine was to take the lead in all foreign patents that might be taken out. I did not expect that a similar § 165—187. circumstance would re-occur; but when it was resolved that an American patent should be obtained, and I attended to sign the preliminary papers, again I found that, without any previous notice having been given me, my name was made to follow yours. I felt that this was not only unjust, but a distinct breach of agreement. I used no importunities as you state; but standing on these grounds, I refused to sign the papers: you then consented to keep your word. The only reason you alleged on this occasion was, that your authority as manager would be diminished if you appeared as second partner.

“Your assertion, therefore, that I yielded to your superior claims at Mr. Lane’s in 1837, is totally without § 188—194; & pp. 151, 152. foundation. From your making it now, it might appear that, when, contrary to previous understandings, you endeavoured by persuasion and other means to have your name placed the first in all documents, it was with the intention that you might afterwards represent that I allowed your share in the inventions to be the most important. You cannot bring forward one word I have ever spoken, or one line I have written, in which I have admitted this claim; and you know well that it was only as co-proprietor and managing partner that I have consented your name should stand first in legal documents.

“I have ever ascribed the commencement of our mis- Pp. 170—198. understanding to the omission of your instrument from the first patent; had it remained as at first intended, we should have appeared to stand on terms of equality there,

and no difference would probably have arisen between us ; but that having been given up as hopeless and omitted, you thought it necessary to put forth claims to a greater share of the remainder than I could admit.

“ All that I have hitherto said refers to our mutual position previous to my communicating to you those results which led to our obtaining a new patent. Up to a certain time I was in the constant habit of communicating to you without reserve every suggestion as it came into my mind, partly because I thought you would take pleasure in everything that might advance our object, and partly because I had no control over the funds furnished you by the companies for carrying our experiments into effect ; and you alone on that account were enabled, if the suggestions were approved of, to put them into practice. It was not long, however, before I observed with regret, that when I proposed any improvement, or obviated any existing difficulty, that you seemed to feel more jealous that I should be the first to suggest, than satisfaction at the result ; and frequently, at the same time you were receiving with coolness my plans, you set yourself thinking how the same thing might be effected, not in a better, but in a different manner. This naturally hurt me, and led me to resolve to interfere with you as little as possible, to carry on my future investigations alone, and to inform you only of the

Pp. 276—282. final results when obtained. After this resolution had been taken, I commenced a series of researches on the laws of electro-magnets, and was fortunate enough to discover the conditions, which had not hitherto been the subject of inquiry, by which effects could be obtained at great distances. This rendered electro-magnetic attraction for the first time applicable in an immediate manner to telegraphic purposes, and I then proceeded to inquire how the principles I had ascertained could be best practically applied. The result was a variety of new instruments and

apparatus, in which, with many entirely new points, I embodied everything I thought valuable which the discoveries of others enabled me to do; some of these, involving the main principles, are described in our patent, while others were, with your consent, withheld. All my new instruments, however, did not depend on electromagnetic attraction, for in some, quite different principles were involved.

“When I had attained some complete and decisive re- Pp. 276—282.
sults, I invited you to the College to see them. Before I described to you my new experiments and showed you my new instruments, I proposed conditions to the following effect:—That having at my own expense undertaken a series of investigations which led to important consequences greatly increasing the pecuniary value of the patents, and having invented new instruments, which, besides being applicable to all the purposes for which the existing arrangements could be applied, might also be profitably applied to other purposes to which the previous instruments were not at all adapted, I required as a compensation for this valuable addition to the common stock, and to enable me to proceed with the experiments, that I should retain the exclusive right of manufacturing them and all instruments I should construct involving the same principles, and also the privilege of employing them exclusively for domestic and official purposes. To these conditions, with others of less importance, you assented: and after I had showed you the instruments which were completed, and read you a list of the further experiments I had in progress, you confirmed in the most unreserved manner this assent. On this occasion you breathed not a word respecting the claim you have since put forward to be considered the joint inventor of my new instruments. This claim of yours I will now take into consideration. You ask me to acknowledge ‘that I, having in progress certain improvements on our joint invention,

depending fundamentally upon principles first discovered and applied by you, and since worked out separately by each of us in forms essentially distinct, had asked you as a favour,' &c. It is unjust to urge such an acknowledgement upon me, and I state plainly that nothing shall compel me to make it. My instruments are as original combinations as were ever put together, and involve a great number of points entirely new. With equal justice might Mr. Ronalds call upon me to declare that he is the joint inventor, because, like him, I have employed a revolving dial with letters; or Professor Steinheil complain of my suppressing his name; because in one of my most important modifications I employ, as he has done, the magneto-electric machine,—as you to put forth that claim, because in some of my new instruments I have employed electro-magnetic attraction, which you had done two or three years before me in your instrument;—or with the same show of reason might Mr. Morse call upon me to proclaim him to be the joint-inventor, because he, independently of you, had employed an electro-magnet to move machinery intended for a telegraph. I am sure I shall be considered as dealing to all parties the full measure of justice, when I acknowledge, as I shall be always ready to do, that Ronalds', yours, Morse's, and Steinheil's instruments have all preceded my last inventions.

Pp. 276—282. “ You also ask me to admit, that the instrument represented in the fourth sheet of the drawings of the new patent is essentially distinct from mine, and was worked out by you separately. I cannot make that admission. The instrument in question was devised by you after my new instruments, and with a full knowledge of all I had done. It involves, as you have acknowledged, a number of things which I was the first to propose. It is not massive like your first instrument, but delicate like mine; it requires my improvements in the electro-magnets; you have made it,

like mine, independent of chronometric arrangement; you employ, as in one of the instruments I proposed, a double magnet with three wires; my principle of relay-circuits is indispensable to its action; and you employ adhesion instead of attraction, as in the first alarm I proposed before I was acquainted with anything you had done. I put in no claim to be called the joint-inventor of your new combination; I only state that my instruments, in which the above principles were embodied, were previously invented by me.

“You allude to a conversation which we had in July last § 212—225. in Lincoln’s Inn, in which you say I admitted the justice and moderation of your claims. On that occasion you put forth none of those assertions to which I now so strongly object; and my impression during the conversation was, that I had hitherto mistaken your feelings, and that there was little, if any, difference in the views we took of each other’s position. I had hoped, from what then passed, that the distance between us was about to be removed, but I made no admissions regarding any of the points at issue.

“I hope I misunderstand you in that part of your letter P. 203, note * which seems to me to hold out a threat, that unless I make an acknowledgement which is untrue, you will withhold your assent to the agreement which is pending between us. Perhaps legally it is in your power to do so; but I can only say, that as, in such case, I could no longer have that dependence on your word or confidence in your honour which I now have, I should break off personal communication with you, and let all matters in future be arranged between our solicitors; and, further, I should not sign a single paper referring to the subject, if your promise to complete this agreement were not redeemed.

“When I entered into a commercial speculation with you I had no intention to give up my right to call my own discoveries and inventions my own, and I thought we had

§ 204—211.

understood each other distinctly on this head, or I would never have connected myself with you. With respect to my own experiments connected with the telegraph, they are so separate from yours, and so intimately mixed up with other theoretical researches and practical consequences in which you have no interest, that I could not, if I would, associate my name with them, particularly since you are unacquainted with the principles on which they are founded. The experiments which I have been accustomed to show at the College have been entirely my own, and you have no right to complain that I did not go out of my way on every occasion to advertise your name to every person who visited me. I do not blame you for describing to your visitors your operations on the railway in the first person singular—you have an undoubted right to do so. When I have occasion to speak of the lines you are laying down or of anything you have done, I always mention your name with the praise it deserves.

“Your name has been frequently before the public: paragraphs have appeared in the public papers ascribing to you the chief, and in some cases the sole merit. You have placed your name prominently first on all the instruments at the railway, so as to produce the impression that you are the principal inventor; and you have allowed your friends to represent that you are the original inventor, my share being that of advising you to carry out the details. Surely I have more reason to feel aggrieved than you have.

§ 196, 197.

“One of your complaints is, that in the notices of my experiments in Belgium, the employment of two wires for an electric telegraph was not specifically mentioned as a discovery of yours. Such a claim on your part has no foundation; for without going further back, Ronalds's telegraphs, two telegraphs on different principles which I myself proposed before I knew you, and Steinheil's tele-

graph, with which I was acquainted before yours, all required only two wires. I have never stated the employment of two wires to be an original idea of my own, but only that my instruments belong to a class in which that condition is fulfilled. Immediately after our acquaintance, I showed you a list of all the projects I was aware of, together with my own, in which they were divided into two classes, according as two or several wires were employed in their construction.

“ You forget that all you have put forward at the conclusion of your letter as the ‘ broad basis of your claim,’ is equally applicable to me. Your words are, ‘ that alone, ‘ unaided and unadvised, you projected, and after five years ‘ of indefatigable perseverance amid the greatest difficulties, ‘ have now introduced into daily use your own project of a ‘ practical electric telegraph, which in theory had remained ‘ for many years a plaything in the hands of scientific men, ‘ and might, but for your exclusive devotion to it from the ‘ first day the idea occurred to you, have remained so till ‘ this day.’ You forget that I alone, unaided, before I was acquainted with you, had carried into effect, at a very considerable expense, compared with my then limited means, the extensive experiments on which all my subsequent researches have been founded. You forget that I have for the last three years worked indefatigably day and night in endeavouring to remove the remaining difficulties, and to make further improvements, when I might have turned myself to objects which would have brought me reputation and profit. You forget that it is *my* electric telegraph and not *yours* that is in daily use. And, lastly, you forget that had it not been for my almost exclusive attention to it since I first conceived the idea, a practical electric telegraph might have still remained an unaccomplished purpose.

Contrast these statements with those of the Award ; pp. 139—143.

Mr. Wheatstone admits that his instrument is not in use. See pp. 186 and 189.

“ Do not, however, misunderstand me. Far be it from me to underrate your exertions ; they have been very

great, and absolutely indispensable to the success of our joint undertaking. Without your zeal and perseverance and practical skill, what has been done would not have been so readily effected; but, on the other hand, I may say, that had you entered the field without me, your zeal, your perseverance and your money would have been thrown away. I am perfectly willing, that considering our joint exertions as tending in different ways to the practical realization of the Electric Telegraph, as a profitable and publicly useful enterprise, that we should be regarded and mentioned as on equal terms; and if I can do anything by which your position in this point of view would be better acknowledged, I will readily do it. But in making this concession I would by no means be understood to forego my undisputed right to call my own researches, discoveries, and inventions, my own, and of publishing them when and in what manner I think proper. You, on your part, will exercise a similar right with regard to your inventions and contrivances. In addition, whilst I claim what merit there may be in working out the laws of electric circuits which have relation to telegraphic communication in the manner I have done, and which will shortly be published, to you will be due the whole merit of laying down the lines and of overcoming all the practical difficulties attending that important operation.

“In conclusion, allow me to say, that notwithstanding the unpleasant differences which have arisen between us, and which I attribute more to erroneous impressions on your part than to any intention to act unjustly towards me, I still unhesitatingly confide my pecuniary interests in your hands, assured that I shall have no cause to regret the trust I have ever reposed in you. It would give me the highest pleasure if the present causes of misunderstanding removed, we could meet again on those terms, when with mutual hopes and undistracted by petty jealousies, we

looked forward in our first beginnings to the end which seems now nearly attained.

“The view of our relative position which I have given above, I am sure you will, on cool reflection, see to be a just one. It is the only one which, unreservedly admitted on both sides, can prevent future disputes and restore our former unanimity.

“I remain,

“Yours very faithfully,

(Signed)

“C. WHEATSTONE.”

“W. F. COOKE, Esq.

Copthall Buildings.”

APPENDIX B.

Correspondence between Prof. Wheatstone and J. L. Ricardo, Esq., M.P., Chairman of the Electric Telegraph Company.

No. 1.

“Lower Mall, Hammersmith,
February 8th, 1855.

“DEAR SIR,

“In a pamphlet recently published by Mr. Cooke, certain statements have been made with reference to my relations to the Company of which you are the Chairman, and for the correct representation of which I conceive I am honourably entitled to refer to yourself. I will thank you, therefore, to direct your Secretary to inform me whether you are aware of any confirmation of my appointment as ‘Scientific Adviser’ to the Electric Telegraph Company in conformity with the terms of the enclosed memorandum; whether I was ever recognized,

or attended any Committee meeting in that capacity; whether I was ever consulted respecting any of the Patents taken out by or for the Company; whether I ever resigned the appointment in question, and whether any salary, or sum in respect of my personal expenses, was ever paid to me. If I am not furnished with a direct negative to these questions, may I ask for the dates of my supposed appointment and resignation, as such circumstances, if they ever occurred, must be recorded in the Company's books.

“ I remain,

“ Yours faithfully,

“ C. WHEATSTONE.”

“ J. L. RICARDO, Esq., M.P.”

No. 2.

“ London, February 13, 1855.

“ DEAR SIR,

“ I have looked back to such papers as I could find in the Office of the Electric Telegraph Company, in order to enable me to answer the questions put to me in your letter of the 8th of this month.

“ So far as I can recollect, it was stipulated by the Company with Mr. Cooke that they should have the advantages of your services at a salary of £700 a-year, should they require them, but it was no part of the agreement that they should be bound to accept them whether they required them or not. The point, however, was not raised, for the Company found themselves involved in a difficulty before the Committee of the House of Lords on their bill, arising from a dispute between Mr. Bain and yourself.

P. 47.

“ In order to obtain their act of incorporation, they found themselves compelled to come to a compromise with

Mr. Bain, by which he became identified with the Company, and was subsequently elected a Director.*

“On this arrangement being made, you declined further connexion with the Company, and therefore the question of your appointment never came before the Board, and I have looked over the Minutes without finding any allusion to it.

“In the meantime you had conducted some experiments at the Strand and at Portsmouth, and I have before me a receipt dated 22nd February, 1847, for expenses incurred, in which you allude to a bill delivered which I think was never sent to the Company, as the only bill I can find is one for the manufacture of certain instruments receipted and dated 23rd July, 1846.

“I am, dear Sir,

“Faithfully yours,

“J. LEWIS RICARDO.”

“PROFESSOR WHEATSTONE.”

No. 3.

“Lower Mall, Hammersmith,
February 21, 1855.

“DEAR SIR,—

“I have received your letter in answer to mine of the 8th instant, and it is to a certain extent what I expected it would have been. There is, however, a point on which you have been misinformed, viz., that on the arrangement being made with Mr. Bain, I declined further connexion with the Company; I wish to know on what authority this statement rests, for neither verbally

* The connexion of the Company with Mr. Bain was not of long duration, and when this impediment was removed, Mr. Cooke took no steps to fulfil his engagement, though urged to do so by Mr. Wheatstone.

nor by writing did I ever make any communication to the Company or to any of its officers to this effect.

“I never refused to accept the position of ‘Scientific Adviser,’ in conformity to the terms of the memorandum to which I referred you, and of which I enclosed a copy.

“My connexion remained, for some time after the arrangements referred to, on the same footing as before, that is, I continued always ready to give any assistance required of me, and I was on several subsequent occasions asked to do so. My connexion in this way did not cease until the beginning of 1850, though my appointment as Scientific Adviser was never confirmed.

“The reason you can find no bill of mine respecting the expenses of the Submarine Telegraph experiments, is that none ever was sent. What I furnished the Secretary with were copies of the bills of Messrs. Walker (for lead), Mr. Mapple, Mr. Darker, and Mr. Lachnal, which I had previously paid. I made no charge whatever for my expenses.

“I remain, dear Sir,

“Yours faithfully,

“C. WHEATSTONE.”

“J. L. RICARDO, Esq., M.P.”

(To this letter no answer was returned.)

APPENDIX C.

Extracts from Mr. Cooke's evidence before the Privy Council, February 12th, 1851.

1.

“Professor Wheatstone was the safe proprietor of his share; his amount was a royalty, and when I came to sell

to the Company, I asked him what sum he wished for his share; he was aware of all the work I had done, and the works in progress; he entered into a calculation, and took £30,000, the amount which he asked. I gave it to him in full. I never bargained nor anything of the kind.

See Mr. Wheatstone's letter fixing his price, p. 44.

2.

“ Q. You will explain, I am sure, how it was that when these Patents were not the sole consideration for the money, the assignments were so drawn up as to make it appear that the Patents were the sole consideration.

“ A. There, if any man, my lawyer was to blame. I never read them through. I was assured that all was right, and it was approved by counsel in the usual way, and of course I put my signature.

“ Sir F. Thesiger—And it has been acted upon.

3.

“ Sir F. Thesiger. — I believe that the invention originated with you, and you called in the science and skill of Professor Wheatstone to assist you?

“ A. I had been engaged about a year and a half before I had the pleasure of knowing Professor Wheatstone, but he, as a scientific man, had been very deep in most valuable parts before I knew him, and he had enlightened the world on most important parts.

 APPENDIX D.

Note on the Submarine Telegraph.

A submarine electric telegraph was, from the commencement of Mr. Wheatstone's experiments, a prominent object in his thoughts. He has several letters dated in the spring of 1837, from gentlemen acquainted with his plans, referring to his project. The first occasion on which any

Pp. 258—261.

allusion to this subject appears in print is in the Fifth Railway Report of the Select Committee of the House of Commons. Mr. Wheatstone was examined before this Committee on February 6th, 1840; and Sir J. Guest, who was previously acquainted with his plans, put the question, "Have you tried to pass the line through water?" to which he replied, "There would be no difficulty in doing so, but the experiment has not yet been made." The Chairman (Lord Seymour) then asked, "Could you communicate from Dover to Calais in that way?" His answer was, "I think it perfectly practicable." Shortly after this, having been furnished with the necessary hydrographic information by his friend Sir Francis Beaufort, and received much useful counsel from the late Captain Drew of the Trinity Board, Captain Washington, and other scientific naval friends, he prepared his detailed plans, which were exhibited and explained to a great number of visitors at King's College, among whom were the most eminent scientific men and public authorities. He also made the subject known in Brussels. In a notice of his new telegraphic instruments, by Prof. Quetelet, published in the 'Bulletin of the Academie Royale de Bruxelles' for October 7th, 1840, it is stated—"On sera sans doute charmé d'apprendre que l'auteur a trouvé le moyen de transmettre les signaux entre l'Angleterre et la Belgique, malgré l'obstacle de la mer. Son voyage se rattachait en partie à cette importante opération, qui mettrait l'Angleterre en rapport immédiat avec notre pays, la France, la Hollande, l'Allemagne, et même la Russie." And in 'Le Fanal,' a Brussels paper of September 30th, 1840, it is observed,—“M. Wheatstone pense qu'il est possible de communiquer avec son appareil entre Douvres et Calais; il répète en ce moments es expériences à l'Observatoire de Bruxelles, en presence de plusieurs savans litterateurs.”

Mr. Wheatstone's plans were also shown in 1841 to

some of the most distinguished scientific men in Paris, who came to see his experiments at the College de France.

In the agreement entered into by Mr. Cooke and himself in April, 1843, it was stipulated that certain limitations therein expressed "should not extend to prevent the said Charles Wheatstone from establishing electric telegraph communication between the coasts of England and France, which he is hereby expressly authorized to do if he shall so please, and for his own exclusive profit."

The agreement made by Mr. Cooke in October 1845, by which he undertook that the Company to whom he was about to sell the Patents should assist Mr. Wheatstone in carrying his project into effect, is given at length in the text, p. 51.

The Abbé Moigno was in England in the spring of 1846, whilst Mr. Wheatstone's experiments were in preparation, and he published an account of what he had seen in 'L'Epoque' of October of that year. This notice he afterwards reproduced in the first edition of his 'Traité de Télégraphie Electrique,' (Paris, 1849). It is as follows:—


"M. Quételet avait annoncé, dès 1840, que M. Wheatstone avait trouvé le moyen de transmettre les signaux entre l'Angleterre et la France, malgré l'obstacle de la mer. J'ai vu de mes yeux, j'ai touché de mes mains le conducteur qui, en se reposant au fond des mers, unira étroitement les côtes d'Angleterre aux côtes de France. Ce conducteur est parfait, il remplira pleinement son but ; tout homme sérieux qui l'aura vu et touché comme moi ne pourra pas même conserver l'ombre d'un doute sur un succès devenu palpable. Avant deux mois, des machines puissantes l'auraient produit dans toute sa longueur, mais partagé en section de deux kilomètres et demi. Huit jours suffiraient aux officiers de marine, qui s'y sont préparé par une étude approfondie, pour le mettre en place, et après

quelques semaines Paris et Londres se toucheraient ; il n'y aurait plus ni abîme, ni distance, le génie de l'homme aurait tout vaincu."

In consequence of Mr. Cooke's non-fulfilment of his engagement, and the proceedings on the part of the Company referred to in the pamphlet, Mr. Wheatstone was obliged to relinquish an object which had been a cherished one with him for many years. The Company, instead of giving him the assistance he relied upon, placed obstacles in his way, and his previous arrangements with Mr. Cooke precluded him from attempting to accomplish it through other channels. The result was that, for a time, the subject was in abeyance ; but five years afterwards it was taken up from Mr. Wheatstone's starting point, and was successfully accomplished by the enterprise and skill of other parties unconnected either with the Company or with himself.



MR. COOKE'S REPLY.



AFTER twelve months' deliberation, Professor Wheatstone has brought out his long-promised Answer to my Pamphlet on the Invention of the Electric Telegraph. I learn from it, with satisfaction, that he at last "contentedly accepts" the Award of Sir Isambard Brunel and Professor Daniell, the Arbitrators appointed, "upon W. F. Cooke's application*" to determine our relative positions in connexion with the invention. At page 30 of his Answer, he ratifies the Award in the following terms :

"In the sense of the Award Mr. Cooke may stand alone, " - - - without the slightest complaint from Mr. Wheatstone" "—' as the gentleman to whom this country is indebted for "having practically introduced and carried out the Electric "Telegraph as a useful undertaking, promising to be a "work of national importance.' Mr. Cooke may fairly "take an honourable pride in this testimony to his prac- "tical discernment and business capacity ; and no one will "be more willing, † than Mr. Wheatstone has ever been, (!) "to acknowledge that, in this sense, he has been the main- "spring of their enterprise. Mr. Cooke is entitled to stand

* Agreement of reference, *Cooke's Pamphlet*, p. 13.

† "Mr. Wheatstone has on no occasion that he can call to mind omitted to make a liberal mention of Mr. Cooke."—*Wheatstone*, p. 86.

“ alone, with the assent of the Arbitrators, for conceiving,
 “ and energetically following up his conception, that the
 “ Electric Telegraph might be made a profitable commercial
 “ enterprise, and for his having carried out an undertaking
 “ of such great importance to the public. His talents and
 “ zeal, his experiments, his negociations, his mechanical
 “ and business arrangements, entitle him to stand alone,
 “ to every intent and purpose which the language of the
 “ Award warrants.”

I accept this testimony from Professor Wheatstone, as far as it goes. But, let any man of common sense, let any friend of his own, compare the article on the Electric Telegraph which appeared in the “ Quarterly Review,” for June, 1854, with the Award by which Mr. Wheatstone, in the complimentary language just quoted, now submits to be bound. I hold Mr. Wheatstone responsible for this article in the “ Quarterly,” because he has, in his recent pamphlet, adopted its conclusions as his own ; because it bears in many parts of it evident traces of information obtained from himself ;* and because, even if he were not directly a party to it, I am entitled to treat it as a natural result of the misrepresentations which he and his friends have been industriously circulating at my expense for eighteen or nineteen years.

The writer of the article referred to mentions my name as that of a “ practical mechanic,” with whom

* For example :—The statement at the beginning of the note, p. 124, that a certain publication *preceded* Mr. Wheatstone's connexion with me, is a repetition of a mis-statement made by Mr. Wheatstone in the Arbitration, respecting a circumstance *known only to him and me*, and of no general interest.

Mr. Wheatstone “associated himself in 1837.” He seems not to have known that I even claimed to have taken a part in the invention. Mr. Wheatstone’s merits are compared with those of Steinheil and others, and preferred, chiefly, if not solely, on the ground of that very practical introduction of the Electric Telegraph which the Award attributes to me alone.

“There are some,” writes the Reviewer, “who dispute Professor Wheatstone’s claim, by urging that, inasmuch as all the main features of the Telegraph existed before he took out his patent, there was nothing left to invent. It is true that much had been done; but it is equally certain that there was much to do. When Wheatstone first directed his attention to electricity as a means of communicating thoughts to a distance, the telegraph was a useless and inoperative machine. He and his partner established, as a working paying fact, what had hitherto been little better than a philosophic toy. To those who now disparage the Professor’s labours, we think it sufficient to reply by the admirable saying of the French *savant*, M. Biot:—‘Nothing is so easy as the discovery of yesterday; nothing so difficult as the discovery of to-day.’” —p. 127.

Let me now turn to the Award. Whether it be called an award, a verdict,* or a treaty,† it is a document which was deliberately considered and revised, and deliberately accepted and signed, by Professor Wheatstone, under the advice and with the concurrence and ratification of his zealous friend, Pro-

* Wheatstone, p. 83.

† Ibid, p. 77.

fessor Daniell. It describes itself as a "statement of *the facts*;" meaning, I presume, a true and not a fictitious narrative. To prevent the necessity of turning back to my former pamphlet, I print the Award again.

"As the Electric Telegraph has recently attracted a considerable share of public attention, our friends, Messrs. Cooke and Wheatstone have been put to some inconvenience, by a misunderstanding which has prevailed respecting their relative positions in connexion with the invention. The following short statement of the facts has, therefore, at their request, been drawn up by us the undersigned Sir M. Ismbard Brunel, Engineer of the Thames Tunnel, and Professor Daniell, of King's College, as a document which either party may at pleasure make publicly known."

"In March, 1836, Mr. Cooke, while engaged at Heidelberg in scientific pursuits, witnessed, for the first time, one of those well-known experiments on electricity, which have been tried and exhibited from time to time, during many years, by various philosophers. Struck with the vast importance of an instantaneous mode of communication, to the railways then extending themselves over Great Britain, as well as to government and general purposes, and impressed with a strong conviction that so great an object might be practically attained by means of electricity, Mr. Cooke immediately directed his attention to the adaptation of electricity to a practical system of Telegraphing; and, giving up the profession in which he was engaged, he, from that hour, devoted himself exclusively to the realization of that object. He came to England in April, 1836, to perfect his plans and instruments. In February, 1837, while engaged in completing a set of instruments for an intended experimental application of his Telegraph to a tunnel on

the Liverpool and Manchester Railway, he became acquainted, through the introduction of Dr. Roget, with Professor Wheatstone, who had for several years given much attention to the subject of transmitting intelligence by electricity, and had made several discoveries of the highest importance connected with this subject. Among these were his well-known determination of the velocity of electricity when passing through a metal wire; his experiments, in which the deflection of magnetic needles, the decomposition of water, and other voltaic and magneto-electric effects, were produced through greater lengths of wire than had ever before been experimented upon; and his original method of converting a few wires into a considerable number of circuits, so that they might transmit the greatest number of signals which can be transmitted, by a given number of wires, by the deflection of magnetic needles.

“In May, 1837, Messrs. Cooke and Wheatstone took out a joint English patent, on a footing of equality, for their existing inventions. The terms of their partnership, which were more exactly defined and confirmed in November, 1837, by a partnership deed, vested in Mr. Cooke as the originator of the undertaking, the exclusive management of the invention, in Great Britain, Ireland, and the Colonies, with the exclusive engineering department, as between themselves, and all the benefits arising from the laying down of the lines, and the manufacture of the instruments. As partners standing on a perfect equality, Messrs. Cooke and Wheatstone were to divide equally all proceeds arising from the granting of licenses, or from sale of the patent rights; a per-centage being first payable to Mr. Cooke, as manager. Professor Wheatstone retained an equal voice with Mr. Cooke in selecting and modifying the forms of the telegraphic instruments, and both parties pledged themselves to impart to each other, for their equal and mutual benefit, all improvements, of whatever kind, which they might become possessed of, connected with the giving

of signals, or the sounding of alarums, by means of electricity. Since the formation of the partnership, the undertaking has rapidly progressed, under the constant and equally successful exertions of the parties in their distinct departments, until it has attained the character of a simple and practical system, worked out scientifically on the sure basis of actual experience.

“ Whilst Mr. Cooke is entitled to stand alone, as the gentleman to whom this country is indebted for having practically introduced and carried out the Electric Telegraph as a useful undertaking, promising to be a work of national importance; and Professor Wheatstone is acknowledged as the scientific man, whose profound and successful researches had already prepared the public to receive it as a project capable of practical application; it is to the united labours of two gentlemen so well qualified for mutual assistance, that we must attribute the rapid progress which this important invention has made during the five years since they have been associated.

M^C I^D BRUNEL.

J. F. DANIELL.

London, 27th April, 1841.”

London, 27th April, 1841.

“ GENTLEMEN,

We cordially acknowledge the correctness of the facts stated in the above document, and beg to express our grateful sense of the very friendly and gratifying manner in which you have recorded your opinion of our joint labours, and of the value of our invention.

We are, Gentlemen,

With feelings of the highest esteem,

Your obedient Servants,

WILL^M F. COOKE.

C. WHEATSTONE.

SIR M. ISAMBARD BRUNEL, and

J. F. DANIELL, Esq., Professor, &c., &c.”

Here we have a document containing four paragraphs, with a letter of acceptance subjoined. In each of the four paragraphs, in the letter, and in the signatures, my name precedes Mr. Wheatstone's. At the beginning and at the end of the Award, and at the end of the letter, the name of my arbitrator precedes that of his.

Priority was thus prominently given to me, in the decision upon a controversy which had mainly turned upon the fact of priority having been yielded to me on former occasions. Two pages of Mr. Wheatstone's long letter, which immediately preceded the arbitration (and which, though proved by the arbitration papers to be full of inaccuracies, he has printed without correction in his Appendix) are occupied with arguments and assertions, intended to account for his having *sought, without obtaining,* priority in the patent rights of 1837. Having stood second in the English patent, and again in the Scotch patent, and again in the Irish patent, he was again obliged to take the lower position throughout our first arbitration,* in November, 1837, and again in the Partnership Deed which resulted from it. In the Case which he himself drew up in the second arbitration, he had his own way for once, and placed his own name first. But when in the draft Award he again put it first, I insisted on its being put last. And finally, with all these facts before them; with printed copies of the Arbitration papers in their hands, affording a perfect facility of reference to the grounds on which I had founded my reiterated

* Arbitration Papers, § 71.

inferences and arguments from Mr. Wheatstone's successive struggles, and successive defeats, on this very question of priority; the Arbitrators, and Mr. Wheatstone himself, advisedly and deliberately adopted my transposition of the *names*, and confirmed it by the order of their signatures.

The same priority was yielded, not without a struggle, to my inventions. My letter to Professor Daniell of the day before the Award contained the following passage:—

“ Professor Wheatstone has - - - - transposed the paragraphs so as to give precedence to his name. To this I cannot consent, as his connexion with the practical undertaking commenced, (even by his own showing,) at a comparatively recent date, and in consequence of my urgent invitation.” *

Mr. Wheatstone's transposition of *paragraphs* was reversed accordingly, and he was obliged to take the second position for his discoveries as well as for his name. The Professor's more intimate friends will feel that the surrender was not, in either case, a trifling one.

The arrangement of names and paragraphs having been, by implication, a decision in my favour, I proceed to show that the Award itself was a decision in my favour, in express terms.

The Arbitrators begin by declaring that the object of their award is to correct, by a “ statement of the facts,” open to publication at the pleasure of either party, a public misapprehension as to our *relative positions in connexion with the invention*.

* Cooke's Pamphlet, p. 19.

They next mention incidentally that before I turned my attention to the subject certain well known experiments on electricity, considered as a possible means of communicating intelligence, had “been tried and exhibited, from time to time, during many years, by various philosophers.”

They next mention a change which had suddenly occurred in my views and pursuits, inducing me to leave existing professional occupations, that I might devote myself exclusively to the realization of a “practical system of telegraphing” by electricity; my journey to England, in April 1836, to perfect my plans and instruments; my engagements in February 1837 in completing a set of instruments for an intended experimental application of *my telegraph* to a tunnel on a railway; and the subsequent commencement of my acquaintance with Professor Wheatstone.

The Arbitrators then record Professor Wheatstone’s scientific researches during several years, on the same subject, enumerating in very full detail his important *discoveries*, but advisedly omitting all mention of any “telegraph” of his at that date, or of any invention of his except the permutating keyboard.

“Messrs. Cooke and Wheatstone” are next introduced as taking out a joint English patent “on a footing of equality for their existing inventions.” The terms of the partnership are next mentioned, vesting in me “as the originator of the undertaking” several valuable privileges, including “the exclusive management of the invention,” “the ex-

clusive engineering department," and "all the benefits arising from the laying down of the lines, and *the manufacture of the instruments.*"

The "*undertaking*" is then said to have "rapidly progressed - - - until it has attained the character of a simple and practical system, worked out scientifically" on the basis of experience.

The last clause attributes to me the practical introduction of the Electric Telegraph as a useful undertaking; and to Professor Wheatstone the profound and successful researches which had prepared the public mind to receive it; and ascribes to our united labours, and mutual assistance, the rapid progress of "this important *invention*" during the four years of our association. This "statement of the facts" is then "cordially" and "gratefully" accepted by us both, as a record of our joint labours and of the *value of our invention*.

Now these statements of the Arbitrators, and acknowledgments of the parties, all had reference to a controversy explained at great length by the respective parties, in printed Cases, and relating almost exclusively to *the origination of the practical Electric Telegraph, which had come into use, as contrasted with the philosophical experiments which had prepared the way for it.*

I am indebted to Mr. Wheatstone for having enabled me to prove this, to the satisfaction even of those of my readers who may not happen to see the volume of arbitration papers. For the Case which Mr. Wheatstone laid before the Arbitrators was

only an amplified repetition of the long letter which he has printed in his Appendix, and which, by rejecting my final appeal to his honour and good feeling, immediately led to the arbitration. From this letter, the Syllabus of his Case, I will presently extract some passages. Here, with impassioned earnestness, he represents that he lost the priority at first by trickery, surprise, cajolery, and above all by my daring assertion that “my invention was more valuable than his”—“that my share was greatly superior to his”—that “my share in the inventions was the most important.”

Now the award in my favour becomes doubly forcible if read as a practical comment upon these statements. Mr. Wheatstone complains of my having unfairly appropriated the priority at starting. The Arbitrators put me first again. He complains of my presumption in calling my invention the more valuable. The Arbitrators speak of my *telegraph* and of his pre-existing *discoveries*. He says that I stood first as manager. The Arbitrators put me first as originator and introducer of the practical telegraph of this country; and dwell, even unnecessarily, on the valuable privileges which a former arbitration* had yielded to me in these capacities.


The Arbitrators could not have so awarded if they believed the following statements of Mr. Wheatstone: nor could he have countersigned the Award, unless he had been convinced at the time that his statements could not be substantiated.

* Arbitration Papers, § 71.

Mr. Wheatstone writes:—

- - - “Firstly, you state that, ‘you alone had succeeded in reducing to practical usefulness the Electric Telegraph at the time you sought my assistance.’ Now this I wholly deny - - - With respect to your statement that I employed myself at your request in perfecting your invention in detail, it is equally erroneous. My time - - - was exclusively occupied in perfecting my own instrument, - - - in which I was not only known to be engaged by all my scientific friends, but which was even announced in public print before I knew of your existence. - - - With regard to the subsequent development of my first telegraph, the essential principles of which are the formation of numerous circuits from a few wires, and the indication of characters by the convergence of needles, - - - it is in all its parts entirely and exclusively my own. The modifications which you introduced, - - - I consider as altering the simplicity and elegance of the arrangement. - - - I certainly should not recognise them in any published description.

“The subject of telegraphic communication has for a long series of years engrossed my thoughts. - - - In 1823, - - - I thought that I had the most efficient and economical means of establishing a telegraphic (or rather a telephonic) communication between two remote points that could be thought of. My ideas respecting establishing a communication of this kind between London and Edinburgh, you will find in the ‘Journal of the Royal Institution’ for 1828, - - - I then turned my attention to the employment of electricity as the communicating agent; - - - and I devised a variety of instruments by which telegraphic communication should be realized on these principles.

 “The real particulars of the circumstances under which your name was allowed to take the lead in the British patents have escaped your memory. - - - I said that I felt myself perfectly confident of being able to carry out my

views to the ends I anticipated; that I fully intended to do so, to publish the results, and then to allow any person to carry them into practical effect. - - - I urged that, in the position in which I stood, to associate my name with that of any other person, would diminish the credit which I should obtain by publishing separately the results of my researches. - - - When we met to settle the preliminaries of the English patent, I was much surprised with the claim you put forward to have your name inserted first. I considered that, as we put ourselves on an equality, by contributing each an invention, to allow my name, which was well known, to follow yours, which was then totally unknown, might be construed into my admitting that your share was greatly superior to mine. You urged - - - that your invention was more valuable than mine. - - - It was finally agreed that my name and yours should stand alternately first in all succeeding patents. Some time after this we met to arrange the preliminaries of the Scotch patent. - - - I was surprised - - - to find that your name was placed first; I objected to this. - - - We came to a new arrangement; on my allowing that your name should stand first in the British patents. - - -

* “Your assertion, therefore, that I yielded to your superior claims at Mr. Lane’s, in 1837, is totally without foundation. From your making it now, it might appear that, when, contrary to previous understandings, you endeavoured by persuasion and other means to have your name placed the first in all documents, it was with the intention that you might afterwards represent that I allowed your share in the inventions to be the most important. - - -

“ - - - All you have put forward - - - as the ‘broad basis of your claim,’ is equally applicable to me. Your words are ‘that alone, unaided and unadvised, you projected, and after five years of indefatigable perseverance, amid the greatest difficulties, have now introduced into daily use

your own project of a practical electric telegraph, which in theory had remained for many years a plaything in the hands of scientific men, and might, but for your exclusive devotion to it from the first day the idea occurred to you, have remained so till this day.'” *

To the letter containing these passages, “the attention of the reader is especially directed,” says Mr. Wheatstone†—and so say I. For the larger his claims, the more confident his assertions, the more unqualified his depreciation of my labours; so also the more complete was his defeat. The Arbitrators not only affirmed my proposition, but also rejected an amendment proposed by Mr. Wheatstone in opposition to it.

In printing ten pages of mis-statements, already refuted by my Case, and condemned by the contrary statements of the Award, Mr. Wheatstone has adopted “a mode of arguing,” not very logical perhaps, but for which there is a royal precedent. “He asserted a proposition,” says Macaulay of James the Second, “and as often as wiser people ventured respectfully to show that it was erroneous, he asserted it again in exactly the same words, and conceived that in doing so, he at once disposed of all objections.” But even waiving the evident contradiction between his acceptance of the Award in one page, and his repetition in another of the refuted mis-statements which the Award condemns, how does Mr. Wheatstone propose to reconcile the Award, according to any possible construction of it, with the assertions contained in his

* Wheatstone, 113—125.

† Ibid, p. 74.

Answer itself? The Award certainly gives me some kind of origination and introduction, and some kind of original equality, and continuing improvement of invention. Mr. Wheatstone allows me no kind of origination or introduction; no share of invention, in origin or development. The “statement of the facts” by the Arbitrators, the “cordial” and “grateful” acknowledgment by the parties of “the correctness of the facts stated,” were prepared and authenticated, with an express view to publication, and in order to remove a public “misunderstanding” of our “relative positions in connexion with the invention,” *four years* after my whole share of the invention had, according to Mr. Wheatstone’s present statements, been discovered by me to be “inefficient,” and “inapplicable to the purpose contemplated;” and admitted by myself to be “abortive;” and with my consent omitted from the patent as “useless*.”

Nor is even this the full extent of the contradiction to which Mr. Wheatstone has deliberately committed himself. For, as he truly observes, † the “Award was made subsequently, not only to the patent already mentioned, but also to the patent of 1840;” which, he says, was taken out for inventions exclusively his, and distinctly acknowledged by me to be such, though “in a pecuniary point of view,” they were to remain our joint property: ‡ inventions, moreover, alleged by him to have been of such value that certain minor arrangements re-

* Wheatstone, pp. 53—55. † Ibid. p. 65. ‡ Ibid. p. 70.

specting them, which I will explain further on, formed "the more important and operative part of the Award,"* and the "substance of the Award."† I may here mention, by the way, that the reason why I did "not venture to face" this substantial Award, while "pursuing its shadow,"† was that I thought it needless to encumber my first pamphlet with the subject of a patent which has run out without coming into use, and therefore passed it over as dead matter. But at the date of the Award the invention of 1840 was believed by all parties to be of great value. Therefore, according to Mr. Wheatstone, the Award was made, not only four years after my part of the original invention had been abandoned by myself as "inefficient" and "inapplicable" and "abortive" and "useless;" but also immediately after Mr. Wheatstone, "without any assistance from Mr. Cooke,"‡ had produced another invention, even more meritorious than the first.§

Enough has been said to show that what Mr. Wheatstone now states cannot be reconciled with the statements which he "cordially" and "gratefully" accepted and adopted in 1841. And here it may be convenient to complete what I have to say on this part of the subject, by adverting shortly to the answer which Mr. Wheatstone gives to my account

* Wheatstone p. 82.

† Ibid. p. 78.

‡ Ibid. p. 67.

§ The Abbé Moigno, a devoted admirer and credulous friend of Mr. Wheatstone's, seems to have been prompted by the Professor, when, with the felicitous accuracy of a scientific historian, he gives the following description of the Award:—

"Je ne dirai que quelques mots des luttes ardentes et passionnées

of the facts connected with our earliest agreement of partnership, and with the application for our first patent. This account was extracted from the arbitration papers into my former pamphlet, and I will here repeat the extract.

“Eventually, our partnership was formed at Mr. Lane’s Chambers in Lincoln’s Inn, early in May, 1837; and Mr. Lane will prove that a very long discussion then took place between Mr. Wheatstone and myself as to money matters, and afterwards a very long discussion as to the priority of names in the patent. Mr. Wheatstone’s own contemporaneous writing proves,

1st, That with his written consent my name took the lead.

que M. Wheatstone a dû soutenir; luttés dont, en France, l’objet a été méconnu et le caractère défiguré.

COOKE ET WHEATSTONE.

M. Cooke ne disputait pas à M. Wheatstone la priorité, le mérite et la gloire de son invention: la querelle n’était au fond qu’une querelle d’amour-propre trop commune entre associés; M. Cooke voulait que tous les appareils dont l’exploitation était précisément l’objet de la société constituée entre eux portassent à la fois les noms des deux associés: Wheatstone et Cooke. Le savant physicien repoussait cette prétention, parce qu’elle lui paraissait illégitime: *il voulait que son nom figurât seul sur les appareils exclusivement inventés par lui*, et n’admettait la présence des deux noms que sur les instruments fruits de recherches communes.

Des arbitres furent nommés: parmi eux figurent des noms célèbres, ceux de Daniell et de Brunel: la paix fut rétablie entre les associés.”—*Traité de Télégraphie Électrique, 2nde Édit. p. 98.*

The author of the passage printed in italics is betrayed at page 28 of Mr. Wheatstone’s Answer, where the Award is described, in terms almost identical, as follows:— - - - “The substance of the Award - - - was to this effect, that Mr. Wheatstone’s - - - right of putting before the public, *as his own*, the inventions described in the 1st, 2nd, and 4th drawings of the specification of the patent of 1840, should be confirmed.”

2nd, That he paid £80 and I only £50 towards the expense of the patent: and other contemporaneous written evidence will show that any surplus was to be divided, not in these proportions but equally.

3rd, Mr. Wheatstone's own writing also proves that I was allowed £130 for past experiments.

“These are FACTS which cannot be disputed, whatever may be the effect of them. Professor Wheatstone was allowed *nothing* for his experiments; yet, in the recent letter already quoted, he rests his claim to maintain his generally received opinion, as inventor of the Electric Telegraph, mainly upon the ground, that ‘he alone, unaided, before he was acquainted with me, had carried into effect, *at a very considerable expense compared with his then limited means*, the extensive experiments on which all his subsequent researches have been founded.’* His not having claimed anything for the expensive experiments which he had made before the commencement of our partnership, presents a striking contrast to his conduct at a later period; when having, in the year 1839, brought a particular series of experiments to a practically useful issue, he asked and obtained an allowance of £100 from the partnership for his expenses in those particular experiments, upon the express ground of the above original allowance to me; although at the time our legal agreement would have enabled me to refuse him any allowance.” †

In answer to the first point, Mr. Wheatstone states that I had *effected without his assent* the arrangement which gave me priority, and that he “subsequently expressed his disapproval of the proceeding.” ‡ My reply is, the subjoined extract

* Wheatstone, App. p. 116.

† Cooke's Pamphlet, p. 35.

‡ Wheatstone, p. 63.

from the heads of our intended partnership agreement, discussed and settled at the office of Mr. Lane, in Lincoln's Inn: immediately after which, we stepped across to the office of the patent agents and lodged our application for the patent. The "heads" contain, first written by myself in initials, and then interlined by Mr. Wheatstone at full length, in his own hand writing, the names of the two *inventors* with my name placed first by himself. The red indicates accurately Mr. Wheatstone's alterations.

"Heads of Agreement."

That a joint patent be taken out for an **Electro Magnetic Telegraph**

~~E. M. T.~~, &c., for the benefit of the joint

William Fothergill Cooke, Esq., and Charles Wheatstone inventors, ~~W. F. C.~~, and Mr. W., subject to the following agreements." * * * * *

Mr. Wheatstone proceeds as follows:—"Mr. Cooke makes a second point of his statement: that, at the outset, the partnership account was charged in his favour with £130 for the expenses of his past experiments, without any allowance to Mr. Wheatstone for any past experiments of his." He cannot allow this plain fact to pass, without attempting to get rid of it by one of those unlucky assertions, which it is his habit to put forward, without evidence or against evidence, whenever he has anything to account for. Does he seriously mean to say that the £130 was given to me as the purchase money of my "useless" and "abortive" machines, in order that "a portion of these

instruments" might pass (which none of them ever did) into his museum at King's College? Perhaps he has forgotten that there is an entry of the allowance, as an allowance for "prior expenses," not for "instruments," authenticated by his own initials, in a book, of which he has the duplicate, as follows.

"1837.

May. W. F. Cooke's prior expenses to be	
deducted from first produce under	
patent	£130 0 0
	W. F. C.
	C. W."

Such is Mr. Wheatstone's answer to what he calls my second point; but unfortunately it is the third point, not the second, which he answers so convincingly, and his year's reflection has not enabled him to answer the second point at all. It remains then, as a fact undisputed and unexplained, that he paid £80 and I only £50 towards the expense of the patent.

My reply not having hitherto followed the exact order of Mr. Wheatstone's statement, I must now revert to the beginning of his Answer, where he opens his argument with an extract from the "Magazine of Popular Science." A notice there given of his experiments is quoted as a publication of them in print* before "he knew of my existence." †

The same statement was made by him in his Case for the Arbitrators, with an additional circumstance: he there referred to "the Magazine of Popular Science for *March*, 1837." ‡

* Wheatstone, p 52. † Ibid. p. 114. ‡ Arbitration Papers, § 267.

The month is now suppressed, in consequence, I must suppose, of its having been proved to demonstration by the arbitration papers, that my "introductory visit" took place on the 27th February.*

The March number of the Magazine contains information on another subject, which could not have been obtained earlier than the 26th February; and the publication to which Mr. Wheatstone refers consists of an editor's note in brackets, crowded into the lower part of a page, partially occupied by a letter from a foreign correspondent, and where a blank would have been left if the note had not been inserted. I find, in four volumes of the Magazine which I have inspected, numerous instances of a space occurring at the end of an article, and invariably left blank to the bottom of the page; and I do not observe elsewhere any similar insertion.

There is something altogether so exceedingly suspicious, both about the form and about the matter of this "announcement in public print," which Mr. Wheatstone puts forward on all occasions as his champion,† that I am half inclined to suspect he got it squeezed into the Magazine at the last moment, in consequence of my having called upon him on the 27th February. It contains a notice of a course of lectures, entitled, no doubt, to notice at the time of their delivery, but which must have become stale news after *eight* intervening

* Arbitration Papers, § 576.

† He sets it out at length in a note to the article in the 'Quarterly,' p. 124.

numbers of the Magazine had unaccountably overlooked them. It cannot, at any rate, be reasonably doubted, that Mr. Wheatstone had, directly or indirectly, some hand in the preparation of the "editor's note;" and I must leave it to him to account for the remarkable circumstance of his suddenly announcing himself in print, at a critical moment, after a nine months' silence.

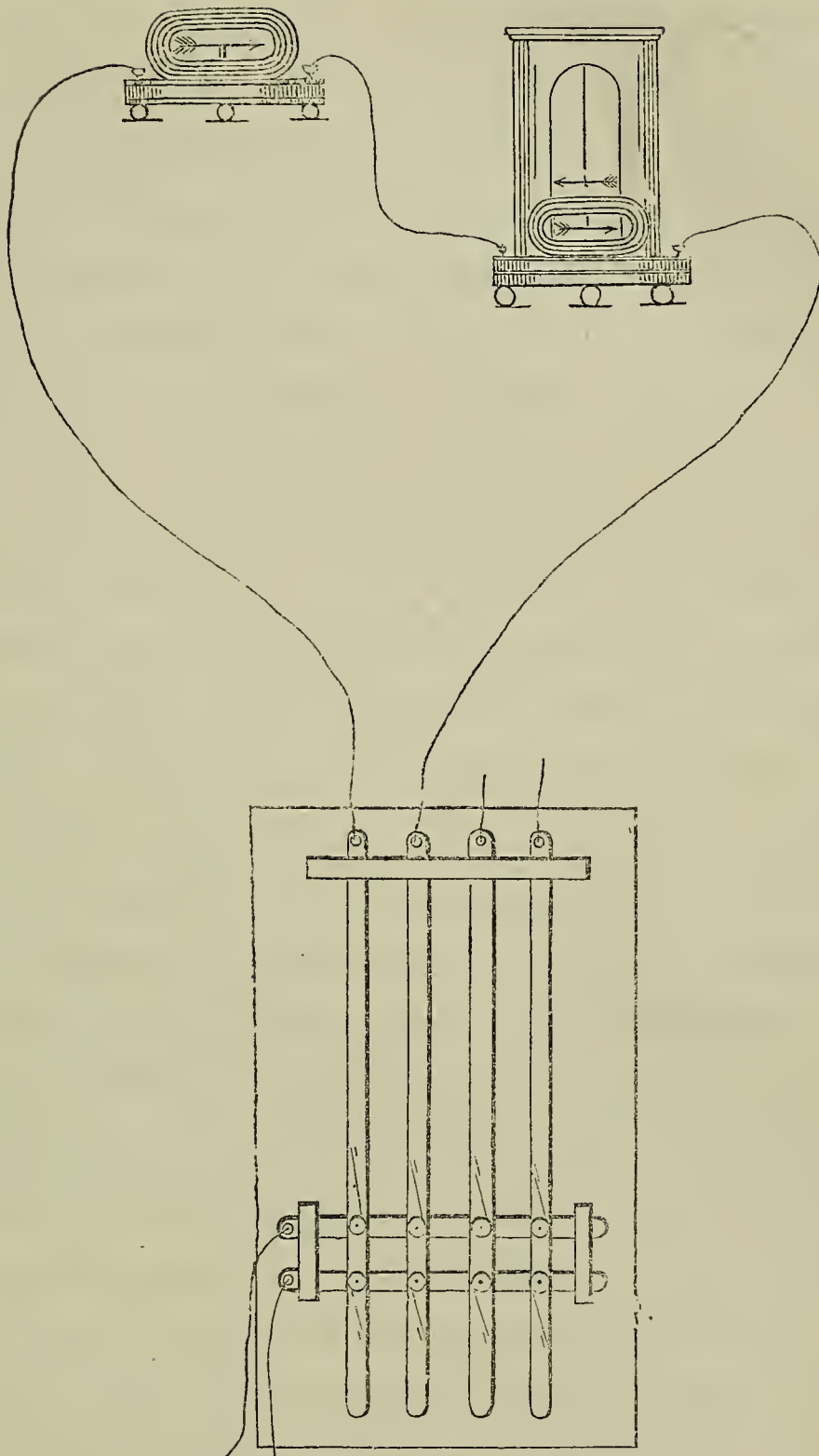
Any thing may be quoted; but when Mr. Wheatstone puts his name to his statements, he expresses them more cautiously. In his letter, he only says, "that he felt himself perfectly confident of being able to carry out his views to the ends he anticipated, and fully intended to do so;"* and the summary, inserted in his own words in the Award, mentions (not, like the Magazine, "the apparatus *as at present constructed*, capable of conveying thirty simple signals,"† but) "his original method of converting a few wires into a considerable number of circuits."

But what does the publication, after all, amount to?‡ It is an account of "a course of lectures," at which Professor Wheatstone's experiments were "repeated." An admiring audience applauded, as in former years, the long line of copper wire, the

* Wheatstone, p. 115.

† Ibid, p. 52.

‡ Remarquons d'abord qu'il n'est guère de physicien à qui l'idée ne se soit présentée d'employer l'électricité comme moyen télégraphique, et que le plus grand nombre de ces physiciens ont cédé au désir de donner de la publicité à leurs procédés. M. Wheatstone disait en 1838 à M. Quetelet qu'il avait déjà recueilli pour sa part les noms de soixante-deux prétendants à la découverte.—*Moigno*, p. 75.



Plan of Professor Wheatstone's Permutating Key-board, being his only telegraphic instrument at the commencement of the partnership: shown in connexion with a Melloni's galvanometer, and a common coil, used in his experiments.

His visitors at King's College in 1836 and 1837 will recognize the accuracy of this sketch.

“bright sparks” on the “revolving mirror,” the decomposition of water, the ingenious permutating key-boards. The notice of this lecture, published nine months afterwards, only shows that a nine-months’ further period of stagnation had been added to the preceding fourteen years of Professor Wheatstone’s unrealised and unapplied telephonic and telegraphic conceptions. At the utmost, it only shows that “he gave *a sketch of the means by which* (like the 62 scientific aspirants mentioned to M. Quetelet*) *he proposed* to convert his apparatus into an electrical telegraph,” in a lecture in June 1836; I having *made* a complete reciprocal working telegraph of two magnetic-needle instruments, each giving twenty-six signals, in March 1836, as proved by a witness in the arbitration.†

“Previous to the date of our first patent” (I am quoting Mr. Wheatstone’s own statement upon oath),‡ “various suggestions were proposed, and even experiments made, relating to the application of electricity to telegraphic purposes; but so little did these notices attract the attention of even scientific men, that, in works of the greatest authority, which profess to give the most complete details of electricity, and of its practical applications, printed either in this country or on the continent, no mention is made of any of these suggestions and experiments.

* Supra, p. 154, note. † See Arbitration Papers, § 18 and 511.

‡ Professor Wheatstone’s affidavit, sworn 2nd January, 1847, in the suit by the Electric Telegraph Company against Nott & others.

“ The notices of them are found scattered through journals or works published in different countries, and at widely different periods, and were never, to my knowledge, collected together, until after public attention had been called to the subject by the practical success of our experiments.”

The scene has changed. Indifference has given place to “enthusiasm.”* “The Introduction to Chemical Philosophy” has not indeed as yet recorded “the practical success of our experiments” as a new and important application of chemical science.† But the author of the “Introduction,”—our future judge, Professor Daniell,—has come back to King’s College from a treat which his friend Professor Wheatstone has given him at Euston Square. The two King’s College Professors will meet half-a-dozen times the next day. But Professor Daniell “cannot refrain from expressing,” instantly in writing, the pleasure he has felt at “witnessing” the “complete success” of the “Electro-magnetic Telegraph.” From the room adjoining Professor Wheatstone’s, Professor Daniell writes Professor Wheatstone a letter.‡ He is “*quite surprised at, and almost at a loss to account for the different effect produced upon*” his “mind by *believing and seeing.*” Although he has “followed all Mr. Wheatstone’s experiments from the beginning,”

* Wheatstone, p. 58, note.

† Professor Daniell’s Second Letter, Wheatstone, p. 83.

‡ Professor Daniell’s First Letter, Wheatstone, p. 59.

and is "intimately acquainted with both the principle and construction of his apparatus," Professor Daniell has been "struck *as with something quite new.*" It has produced in him "something of the feeling of magic." He is now satisfied that the telegraph must be "adopted upon all railroads immediately," as well as "upon an extensive scale for private communications."

Oh! the *magical* difference between "believing and seeing!" — between *believing* Professor Wheatstone's ideal inventions at King's College, and *seeing* Cooke and Wheatstone's practical telegraph at Euston Square!

Two years after making his Award, Professor Daniell writes another letter.* Professor Wheatstone, his intimate friend, has applied to him "*ex parte,*" by a private letter, of which the contents are not stated. The Judge answers from memory, with scarcely that degree of circumspection and accuracy which the delicate occasion demands. He says, "the Arbitrators insisted, as a preliminary step, "upon the withdrawal and destruction of 1000 "printed copies of an *ex parte* statement of evidence "proposed to be brought forward, and of a most "intemperate address prepared by Mr. Cooke's "solicitor. This having been complied with, the "statement in question was agreed to, and signed "both by the Arbitrators and joint patentees."

That the printed papers were not destroyed till some days after the Award had been signed, appears

* Reprinted from Mr. Wheatstone's Answer, *infra*, p. 164.

by the letter printed at foot.* I also hold "the agreement which - - - covenanted that Mr. Cooke's printed papers should be placed at the disposal of the Arbitrators,"† an extract from which is sub-joined,‡ and which was not even written till after

* 1, Copthall Buildings, 1st May, 1841.

DEAR SIR,

I have much pleasure in handing you some printed copies of the Award made on the 27th ult. I shall best express Mr. Cooke's and my own sense of the very laborious part which you have taken in the business by assuring you that it has ended in a manner gratifying in the highest degree to Mr. Cooke and his friends, as the Award will place him in his true position, without interfering with that amicable intercourse which is so essential to the interests of the undertaking, and without unnecessarily lowering Mr. Wheatstone. We propose to make the Award known in the least offensive manner, viz., by distributing copies of it.

Mr. Daniell has desired me to send you the printed copies of the papers (retaining a few copies for the present), with a request that you would burn them in your furnace. *I think it is very important* in every point of view that you should place them in the hands of some confidential person who will destroy them all. Perhaps Mr. Law would be kind enough to see to it. I enclose an account of the bundles sent. - - -

I am, &c.,

SIR M. ISAMBARD BRUNEL,
Thames Tunnel.

ROBT. WILSON.

† Wheatstone, p. 78.

‡ At the Meeting held at King's College, on the 27th April, 1841—For the purpose of settling Messrs. Cooke and Wheatstone's arbitration, it was this day agreed between the parties, with the sanction of the Arbitrators:—

1. That Mr. Wheatstone's separate privileges be confirmed, and that Mr. Richardson and Mr. Wilson proceed immediately to prepare a proper deed, all questions which may arise being reserved for the consideration of the Arbitrators, who are to determine them under the powers given by the agreement of reference.

the signature of the Award; when it was drawn up by my solicitor from the instructions of the Arbitrators, and in the presence of the parties. The minute of proceedings, made at the time by my solicitor, contains the following statement:—"After the paper, No. 1," (the Award) "had been signed, I drew up a memorandum for signature, as to the separate rights, expenses, and other matters." Consistently with this minute, the original signed document is extant in my solicitor's hand-writing. And it must be evident, from its contents, that it could not possibly have been signed before the Award. For it would have been premature to provide for payment of costs before the litigation had been terminated. However, the question has been set at rest by Mr. Wheatstone, who expressly admits that the consideration of his "separate privileges," with which subject the memorandum in question commences, was "agreed to be postponed until the relative positions of the parties were defined."*

But to return to Mr. Daniell's letter. Was Mr. Wheatstone justified in using this behind my back, as a judicial interpretation of the Award?

2. That the printed papers be placed at the disposal of the Arbitrators, who have consented to return the other documents to the parties.
3. That the expenses of both parties in this arbitration be partnership expenses, and be paid out of the proceeds.

* * * * *

WILLM. F. COOKE.

C. WHEATSTONE.

Approved

MC. ID. BRUNEL,

J. F. DANIELL.

* Wheatstone, p. 75.

He says* that he “has ever been contented with the position assigned to him” by Mr. Daniell’s letter, and that it “is fairly his due.” I cannot think, however, that it was fairly Mr. Daniell’s due, to be placed by his friend in the questionable position of having made his award in cypher; with a key for the initiated members of the philosophic brotherhood, to whose protection Mr. Wheatstone so confidently commits himself. I doubt whether the open and impartial judgment of a higher tribunal, to which, after thirteen years of forbearance, I was constrained to appeal, will find in my solicitor’s private letter,† written to a private friend—a letter of which I had no knowledge till Mr. Wheatstone’s publication led me to inquire for it—any reason for a departure from those vulgar rules of fair play and judicial publicity to which Englishmen are accustomed.

I shall make a few comments on my solicitor’s letter, and Mr. Daniell’s which followed it, after first printing them entire :—

1, Copthall, Buildings, 5th May, 1843.

DEAR WARD,

With reference to our conversation of this afternoon, it occurs to me that I ought not to have said that I would show you the papers in the arbitration between Mr. Cooke and Mr. Wheatstone, for to do so would only reopen personal matters which I should wish to be forgotten; and though my agreement was subject to your obtaining Mr. Wheatstone’s consent, he could scarcely refuse his consent if asked.

* Wheatstone, p. 84.

† Ibid. p. 82.

I send you, however, the *drawings*, which contain nothing personal, and which I was ready to verify before the Arbitrators by the instruments themselves, and unquestionable documentary evidence. Not that they comprise the whole of Mr. Cooke's Case; for there was much other matter equally important, if not more so.

If you say anything to Mr. Wheatstone about these matters, you will oblige me by adding, that the subject is one which I never go into, except when Mr. Cooke's vindication requires me to allude to it. With that addition you can say anything you may think proper. I maintain, not as a matter for discussion, but as one which *I know of my own personal knowledge as a fact*, that Mr. Cooke was in the right and Mr. Wheatstone was in the wrong; and I think you must entertain the same opinion on re-perusing the enclosed award, and hearing that it was signed after Mr. Wheatstone had conned it over deliberately at home, and with the advice of his friends—Professor Daniell, at least, if not others—with alterations suggested by himself in details; with the account of what he had done inserted in his own words; and with other alterations which he wished (one of which was to put his name first) *declined*.* Considering, moreover, that the expenses of the arbitration, Mr. Cooke's amounting to many hundred pounds, were, after much opposition, and a long deliberation on the part of the Arbitrators, ordered to be paid out of the proceeds of the invention; what does plain common sense say to these plain facts?

Yours always,

F. O. WARD, Esq.

ROBT. WILSON.

P.S.—Observe all that I am doing is to prove that the Award is not wrong. I go into older matters for that purpose only.

* The words in italics are underlined in the original.

King's College, London May 24th, 1843.

MY DEAR WHEATSTONE,

“In reply to your note of yesterday, I beg to state that I have a perfect recollection of all the circumstances under which the ‘Statement of Facts’ regarding the Electro-Telegraph was agreed to, and signed by Sir M. Isambard Brunel and myself. You have, not quite correctly, called it an ‘Award’ of the arbitrators; for, strictly speaking, the arbitration was not proceeded with. The Arbitrators, considering the pecuniary interests at stake, and the relative position of the parties in those respects, were of opinion that, without entering into the evidence of the originality of the inventions on either side, a statement of facts might be drawn up, of the principal of which there appeared to be no essential discrepancy in the statement of either party, which might amicably settle the unfortunate misunderstanding which had occurred. It was with a view to promote such an amicable settlement, that the Arbitrators insisted, as a preliminary step, upon the withdrawal and destruction of 1000 printed copies of an *ex parte* statement of evidence proposed to be brought forward, and of a most intemperate address prepared by Mr. Cooke’s solicitor. This having been complied with, the ‘Statement’ in question was agreed to, and signed both by the Arbitrators and joint-patentees.

This document makes no assertion whatever as to the originality of the inventions on either side, neither was it necessary or expedient that it should do so; for, whenever you and Mr. Cooke may think it advisable to publish the details of your several inventions, the scientific public will want no guide in forming their own opinion upon their resemblances, differences, and merits.

Intimately acquainted as I am with the particulars and

progress of your own undoubted inventions, I have no hesitation in expressing to you upon paper the opinion which I have always expressed to others, viz., that they are of incomparable beauty and simplicity, and by themselves sufficient to supply all the purposes of the most extended telegraphic communication. I will moreover repeat that which I have already published in my 'Introduction to Chemical Philosophy,' viz., that your contrivances would have been of no avail for telegraphic purposes, without the investigation which you were the first to make, of the laws of electro-magnets when acted on through great lengths of wire.

I remain, my dear Wheatstone,

Ever faithfully yours,

J. F. DANIELL."

TO PROFESSOR WHEATSTONE, &c., &c., &c.

Professor Wheatstone introduces his comments upon Mr. Daniell's letter by complaining that "Mr. Cooke *had obtained more than his own share of credit, and especially from*" the Award! in other words, being dissatisfied with the public Award of our joint Arbitrators, because he thought it had given me more than my share of credit, he tried to set it aside by a counter-award, obtained, for private use, from his private friend. He complains, that, immediately after the public Award appeared, I "circulated it extensively, without any allusion" to the memorandum given in a former page.* It is sufficient to say, that the public Award itself, in the exercise of an express power given to the Arbitra-

* Supra, p. 160.

tors by the agreement of reference, begins by declaring itself to be "a document which either party may at pleasure make publicly known;" while the publication of the memorandum (though also in my favour) is not authorised, and was obviously not intended. Mr. Wheatstone continues:—

"In furtherance of his construction, his solicitor in a letter to a friend of Mr. Wheatstone, dated May 5, 1843, asserted 'that Mr. Cooke was in the right and Mr. Wheatstone in the wrong;' and that the signing of the statement in question, coupled with the fact of the expenses of the arbitration, 'Mr. Cooke's amounting to several hundred pounds,' being paid out of the proceeds of the invention, proved that this was the case. To protect himself, therefore, from this summary and unjust conclusion, Mr. Wheatstone wrote to Professor Daniell, *to ask him whether the inferences thus put forward were correct.* Professor Daniell's letter, which is subjoined, is the 'alarming document' of which Mr. Cooke speaks in page 41 of his pamphlet, and of which he appears to feel a salutary apprehension. His question—'how Mr. Daniell could reconcile any such letter with the character of a judge,' may be easily answered. Professor Daniell had learnt the unfair construction which Mr. Cooke* sought to put upon his judicial act; and in accordance with the 'manly and upright character' which Mr. Cooke allows to him, he performed a necessary incident of his judicial duty. His letter, written to sustain the true and to repel the false interpretation of his verdict, may be left, however, to justify itself."†

But how, or where, does Professor Daniell's

* Query—Mr. Cooke's solicitor, in a letter to a friend?

† Wheatstone, p 82.

private Award repel any false interpretation of his first verdict? “Mr. Wheatstone wrote to Professor Daniell to ask him whether the inferences thus put forward were correct.” Professor Daniell neither repels Mr. Wilson’s “inferences,” nor denies his statements. Mr. Wilson says,—“*I know of my own personal knowledge as a fact, that Mr. Cooke was in the right and Mr. Wheatstone was in the wrong.*” Professor Daniell justifies Mr. Wilson, and corrects Mr. Wheatstone, by declaring that what Mr. Wheatstone then called the Award (and now calls a verdict), was “*a statement of facts.*” —Well! be it so.—Mr. Wilson goes on to say, that the Award “was signed after Mr. Wheatstone had conned it over deliberately at home and with the advice of - - - Professor Daniell - - - with alterations suggested by himself in details, with the account of what he had done inserted in his own words, and with other alterations which he wished (one of which was to put his name first) *declined.*” Professor Daniell does not deny this—for he knew of his “own personal knowledge” that every word of it was true. Mr. Wilson concludes by asking a straightforward question: “What does plain common sense say to these plain facts?” an enquiry which Professor Daniell leaves unanswered. His letter seems, in fact, to have had no connexion with Mr. Wilson’s letter of a fortnight earlier, except that this may have suggested the idea of it, and have afforded a pretext for getting it written.

I have already had occasion to point out an

inaccuracy in the first paragraph of Mr. Daniell's letter.* I will now mention a second. Mr. Daniell writes that "the Arbitrators - - - were of opinion that - - - a statement of facts might be drawn up, of the principal of which there appeared to be no essential discrepancy in the statement of either party." Let the reader compare our Cases; or if he has not the volume of Arbitration Papers before him, the statements of Mr. Wheatstone's long letter in his Appendix, or my summary of it,† with the statements of the Award.

The second paragraph states, that the Award "makes no assertion whatever as to the originality of the inventions on either side:"—it only records the existence of Mr. Cooke's telegraph when Professor Wheatstone had none, and places the partners on "a footing of equality for their existing inventions," which equality it declares they maintained, from May, 1837, to the date of the Award, in April 1841.‡

The third and last paragraph pays a compliment to Professor Wheatstone, on his adaptation of the theory of Ohm to the electro-magnet of the patent of 1840, in language so florid, that I almost recognise a second "account of what Professor Wheatstone had done, inserted in his own words."§

Though it must be a subject of regret to Mr. Daniell's friends that his letter should have been brought forward in this controversy, I need not impute to a man, so deservedly respected by all

* Supra, p. 164.

† P. 144—146.

‡ P. 138.

§ Mr. Wilson's Letter to Mr. Ward, p. 162.

who knew him, any greater fault than a strong bias in favour of a brother philosopher and intimate friend, and a great degree of indiscretion, in trusting to another person a testimonial, liable to be, as it has been, abused to purposes deserving of more severe reprehension.

His letter cannot, indeed, be justified; but it may, I think, be excused, as an act of incautious friendship. Its object and character were well described by anticipation, as follows:—

“Ignorant though we be of the nature of this singular document, we have no difficulty, if it was written by Professor Daniell, in predicting its contents. Its object, doubtless, was to sweeten the bitter pill of the Award. It was an opiate tenderly administered to disappointed vanity, —a curb, perchance, to that morbid appetite for fame, which respects neither individual rights nor social feeling. By this anticipation of its purpose, we at once protect the character of its author, and the rights of the individual which it has been brought forward to assail.”*

For Professor Wheatstone himself I can admit no excuse. I charge him, on his own confession, with having induced our judge to write an unguarded private letter, in order that he might make use of it clandestinely to falsify the legal Award. I do not believe that the “Scientific World,” by whom he claims to be judged, will tolerate such conduct; but I cannot admit that the subject is one “adapted for their special cognizance,” or inappropriate for the consideration of the “promiscuous

* North British Review, January, 1855, p. 577.

passengers on the railways of the United Kingdom"* over which the Electric Telegraph is so widely extended.

“The Magnetic-needle Telegraph - - - is the instrument, upon which,” as Mr. Wheatstone tells us, he “relies for a refutation of Mr. Cooke’s claim to have participated in his invention. - - - “During the drawing of the specification,” he says, “and “after the description had been prepared, Mr. Cooke, “ - - - having become convinced of the inefficiency “of his instrument, withdrew its description and the “accompanying drawings from the specification, “leaving Mr. Wheatstone’s to stand alone. In this “instrument Mr. Cooke had not the slightest part. “This Telegraph was entirely and exclusively Mr. “Wheatstone’s invention, in no respect derived or “borrowed from any ideas of Mr. Cooke, or from “anything he had done, but designed in pursuance “of Mr. Wheatstone’s plan, which had previously “been announced in public.” “The Electro- “magnetic Alarm,” Mr. Wheatstone adds in a note, “brought into action by means of a short secondary “circuit, which forms a separate part of the first “patent, was also an invention of Mr. Wheatstone’s. “But as Mr. Cooke stated that he himself had “proposed to ring a bell by means of an electro- “magnet, and also claimed an independent origi- “nality in the idea of effecting this action by means “of a secondary or relay circuit, Mr. Wheatstone

* Wheatstone, p. 82.

“has always represented this as a joint invention.
“It is, however, the only one which can be consi-
“dered as having been made in common during
“the entire period of their association.”*

If these statements are correct, let me again ask what did the Arbitrators mean in attributing to me, after a lapse of four years, not only an original position of equality at the date of the patent, but also a sustained position of equality in the “rapid progress” of “this important invention”? And would they have recorded, without comment, my title, under a former arbitration, to “all the benefits arising from the manufacture of the (original) instruments”; with the fact before them that Mr. Wheatstone had sought and obtained, on the ground of invention, the very same privilege as regarded his later instruments of 1840?

Passing over the Detector, one of the things included in the first patent, and which was indisputably mine, I will deal first with Mr. Wheatstone’s claim to the Alarum.

“Before the end of March 1836, I had invented the Alarum, which is still extant in my first Mechanical Telegraph. It was one of ordinary construction, worked by clockwork mechanism on a removal of a detent. My invention consisted in placing a voltaic magnet in such proximity to an armature of soft iron forming the tail-end of a lever detent, that when an electric current passed round the voltaic magnet, the magnetism which was for

* Wheatstone, p. 55.

the moment excited in it attracted the tail-end of the lever, and by so doing drew its detent-end out of the clockwork; but on the temporary magnetism ceasing with the cessation of the current, the attraction of the tail-end of the lever ceased also, and the detent-end of it was then replaced in the clockwork by a reacting spring or balance weight*.”

Mr. Wheatstone having failed to discover, after a careful investigation, any trace of a previous application of the attractive force of an electromagnet to let off an alarum, that principle was claimed in our specification as part of the invention comprised in the first English patent; and at a later date, when, in the language of Mr. Wheatstone's affidavit already referred to, the “notices” of former “suggestions” and “experiments” “scattered through journals or works published in different countries and at widely different periods,” had been “collected together,” and published, our claim to the Alarum, as an absolutely new principle, stood the test of the severest scrutiny in a court of law.†

In his Case in the arbitration, Mr. Wheatstone, tried to disparage my Alarum by referring to previous “suggestions” by scientific men at home and abroad, of various modes, different, it is true, in principle from mine, in which the attention of

* Arbitration Papers, § 26.

† The Electric Telegraph Company *v.* Brett and Little, tried at Guildhall on the 21st, 22nd, 23rd, and 25th February, 1850, before Lord Chief Justice Wilde and a special jury. Judgment given by the Court of Common Pleas at Westminster in favor of the patent, 26 April 1851.

the observer might be called “to the telegraphic apparatus previous to a communication being made.” “Ronalds,” he said*, “in 1823, for this purpose exploded a Volta’s pistol by means of the electric spark, as Cavallo (Treatise on Electricity, 1795, vol. iii., p. 390) had long before proposed. Weber and Gaüss, in 1835, caused a heavy magnetic needle to strike a bell; and Baron Schelling,† of

* Arbitration Papers, § 297. See also Wheatstone, p. 56, note.

† It is an old saying, that “those who live in glass houses should not throw stones.” Mr. Wheatstone’s reference to Baron Schelling’s alarum induced me to consult his friend, the Abbé Moigno, on the subject, who gives, as an invention of the Baron, the very prototype of Professor Wheatstone’s five-needle instrument, with a key-board and “*five vertical magnetic needles*”—as well as—the alarum mentioned in the text. That Professor Wheatstone was not ignorant of Baron Schelling’s instrument is evident, from his allusion to it in paragraph 276 of the Arbitration Papers, where he says, “I understand from Professor Jacobi, that Baron Schelling, of St. Petersburg, exhibited at the meeting of German naturalists, held at Bonn in 1835, his magnetic-needle telegraph, one of the most perfect made before my experiments, and which appears, from Professor Jacobi’s description, to be almost identical with an apparatus made by Mr. Cooke subsequent to the invention of my magnetic-needle telegraph.” Without dwelling upon the fact, that my pair of reciprocal telegraphs, thus spoken of, were made in March, 1836, as proved before the Arbitrators by my witness, M. Hoppner, who assisted me in making them at Heidelberg, and that Mr. Wheatstone certainly did not *conceive the idea* of his vertical needle-telegraph before July, 1837,—I will simply extract the account of Baron Schelling’s apparatus from the Abbé Moigno’s work, and leave the reader to judge how far it was “identical” in its keys and five vertical needles, with the telegraph exhibited at King’s College.

“SCHELLING.

M. Amyot, dans une note présentée à l’Académie des Sciences le 9 juillet 1838, raconte qu’en 1832 ou 1833, M. le Baron Schelling *qui n’était point à ce qu’il paraît un physicien, un savant, mais un*

St. Petersburg, in 1833, caused a small watch-alarum to be discharged by a motion produced by the deflection of a magnetic needle." What a liberal encouragement for the philosopher to bestow upon the military man, who, having hitherto derived his principal scientific knowledge, as (Mr. Wheat-

simple amateur, (like myself, not one of those "true fellow labourers" whom Professor Wheatstone, at his 10th page, is "proud to acknowledge," and therefore of course fair game) construisit à Saint-Pétersbourg un télégraphe électrique qui consistait en un certain nombre de fils de platine isolés et réunis dans une corde de soie, lesquels mettaient en mouvement, à l'aide d'une espèce de clavier, cinq aiguilles aimantées placées dans une position verticale, au centre du multiplicateur." (Oh! Professor Wheatstone, how could you overlook this, while quoting against me so accurately the following description of Baron Schelling's alarum?)—"Il avait joint à son appareil un mécanisme fort ingénieux, dont l'idée était à lui, et consistait dans une montre à sonnerie, espèce de réveil, qui, lorsque l'aiguille tournait au commencement de la correspondance, était mise en jeu par la chute d'une petite balle de plomb que faisait tomber la pointe de l'aiguille aimantée.—*Moigno*, pp. 79 and 80.

The Abbé states, that before he could comply with the wishes of the Emperor ("qui fut témoin d'expériences faites sous ses yeux avec ce télégraphe") by carrying out his plans, Schelling died. The saying is not always true that "dead men tell no tales!" Is it not strange that Professor Wheatstone should see an identity between Schelling's "lead ball," and my "voltaic magnet," in sounding an alarum, but that his scientific eye could see no type or trace of his own "five-vertical-magnetic-needle telegraph, with five multipliers and keyboard" of 1837, in Baron Schelling's "five-vertical-magnetic-needle-telegraph, with five multipliers and key-board" of 1832 or 1833?

I have no claim to the vertical needle myself, and should have had no inclination to quote Schelling in opposition to Mr. Wheatstone's claim to it, but for his very unfair reference to Schelling against me: indeed I always thought that he first found it described in an Italian work. *Arbitration Papers*, § 298, and *Wheatstone's Answer*, p. 56, note.

stone slightly observes,) from “Mrs. Somerville’s Connection of the Physical Sciences,” had sought his scientific aid ! Was my solicitor “intemperate,” when he thus expressed to the Arbitrators his honest indignation at such a line of defence—“Gentlemen, - - - if Professor Wheatstone succeeds in defeating Mr. Cooke’s just claims, by raking up every unapplied and unpublished experiment which his scientific connexions may now be able to furnish him with, he will confirm to all the world the common saying, a true saying, I fear, sometimes, though, I hope, not often;—that an inventor acts more wisely in taking out a defective patent for an imperfect invention, than in consulting a scientific man.” *

Although, however, Mr. Wheatstone sought, in the arbitration, to disparage my Alarum, he did not then pretend to say that he had invented the same thing, but only set up in competition with it an ideal alarum of his own, which, until mentioned in his Case, no one had ever heard of. So that, in the arbitration, the issue of fact respecting the alarum stood thus:—“Mr. Cooke’s alarum” (I am again quoting my solicitor’s opening address) “- - - stands recorded in all the specifications of the patents, and is at work wherever the Electric Telegraph is in use; and not only is there no extant description of Mr. Wheatstone’s supposed - - - alarum, in the specifications or elsewhere, but it cannot be pretended by himself that it was

* Arbitration Papers, § 607.

ever at work anywhere, or ever tried anywhere, or ever made at all." *

How then are we to understand the apparent discrepancy between Mr. Wheatstone's claim in the arbitration, and the claim contained in his answer to my pamphlet? How will he account for this when he writes his rejoinder? Very easily. What he *says* in his answer, though it cannot fail to mislead any one who reads it, by conveying the impression that he claims the alarum itself, is only a piece of special pleading, not a formal contradiction of his former statement. For what he now calls a joint invention, is not the "electro-magnetic alarm," pure and simple, but the "electro-magnetic alarm *brought into action by means of a short secondary circuit*:" and it is true that the temporary expedient of the short secondary circuit was devised by Mr. Wheatstone and myself "in common," during our joint endeavours to discover and remove the cause which prevented the action of the electro-magnet at long distances.

But was the rest of the magnetic needle telegraph "entirely and exclusively Mr. Wheatstone's invention"? It is true that the "hatchment" dial was his, and that the key-board as specified contained his permutating keys; and I will presently explain how this happened. But by his own showing, the essential principle of the combined apparatus was mine and not his. Here, then, is another piece of special

* Arbitration Papers, § 617.

pleading. Mr. Wheatstone expresses himself so as to lead his readers to understand that the whole invention, both in form and in principle, belongs to him. Whereas, his meaning must be, if this statement is to agree with his other statements, or with the facts, that it is the peculiarity of form and not the principle which he intends to claim.

“The fallacy of Mr. Cooke,” he says,* “appears to consist in this,—that, because his instrument included a reciprocal communication, and Mr. Wheatstone’s included the same, Mr. Cooke’s principle was the basis of Mr. Wheatstone’s system.” He then goes on to divide this supposed fallacy into an error in fact, and an inconsequent conclusion, alleging—

First,—that my principle was no novelty and,

Secondly,—that, if new, it could not have escaped “the attention of any person engaged on an Electric Telegraph, if the mechanical arrangement of the instruments had rendered it at all possible.”

Mr. Wheatstone rests the issue of novelty upon Gäuss and Weber and Schelling,† whose published experiments appear to have no bearing on the question of reciprocal communication, and “especially” upon Mr. Ronalds’ plan for an Electric Telegraph, published in 1823.‡ This was to consist of two

* Wheatstone, p. 62.

† Ibid, p. 56 & 63.

‡ Ibid, p. 63.

clocks, showing letters, timed together, but wholly independent of each other, and wholly independent also of a line of wire, which was to be insulated, in tubes of glass, between the two places where the clocks were respectively to stand. When the person desirous of sending a signal saw on his own clock the signal which he wished his correspondent to note on the distant clock, he charged the conducting wire by an electrical machine, which was to produce the divergence of two pith balls at the distant clock; and under the conditions of perfect insulation of the wire, and perfect coincidence of movement in the clocks, the warning to look for the signal might reach the correspondent at the right moment; whose attention was to have been secured by causing an electric spark to fire a pistol in the first instance. Mr. Ronalds' telegraph was not a combined system of apparatus, constructed so as to work reciprocally, but three separate and independent elements of communication, viz., the two clocks and the line of insulated wire, arranged into a kind of partnership, for the purpose of producing a combination of effect by a coincidence of action.

But, although the principle of reciprocal communication is not to be found in Mr. Ronalds' telegraph, it was "developed completely and effectively," in a magnetic needle telegraph which I made at Heidelberg in 1836; which was brought over to London for the purposes of the arbitration; which Mr. Wheatstone has seen, and of which

(though he now ignores its existence) he has an accurate drawing in his possession.* My former pamphlet extracted from the arbitration papers a description of this telegraph, accompanied by a clear definition of its essential principles. To save the trouble of reference, I will extract the passages again.

“ Within three weeks after the day on which I saw the (Möncke’s) experiment, I had made, partly at Heidelberg and partly at Frankfort, my first Electric Telegraph, of the galvanometer form, which is now at Berne. It has been written for, and shall be laid before the Arbitrators. I used six wires, forming three metallic circuits, and influencing three needles. I worked out every possible permutation and practical combination of the signals given by the three needles, and I thus obtained an alphabet of twenty-six signals. I had invented the instrument which I called the DETECTOR; by means of which injuries to the wires, whether from water, fracture, or contact, are readily traced; an instrument which in practice is never out of my hand, and without which the Electric Telegraph would be impracticable. But my principal improvement was, that my Telegraph did not merely send signals from one place to another, but that it was, even at that early period, a *reciprocal telegraphic system*, by which a mutual communication could be practically and conveniently carried on between two distant places; the requisite connections and disconnections being formed by pressing the fingers upon keys, and the signals being exhibited to the person sending, as well as to the person receiving, the communication. This improvement was effected by placing a system of keys permanently at each extreme end of the metallic circuit, and

* Arbitration Drawings, Part B.

by providing each circuit with a cross-piece of metal, for completing the continuity of the wires when signals were being received from the opposite terminus. The two signal apparatuses being thus thrown into the course of the metallic circuit, every signal was given at both ends concurrently; and the cross-piece was made to restore the circuit for a reply, on the first communication being completed. This united and reciprocal property is the basis of the Electric Telegraph, and is inseparable from the practical system. It has been my leading principle throughout, and has impressed itself even upon the forms of my instruments: their distinguishing characteristic from first to last being, that my keys and signals have always been joined together into one instrument,* and the several instruments into one reciprocal system. In a word, the Arbitrators will here recognise the earliest form of the RECIPROCAL COMMUNICATOR, the fundamental condition of the Electric Telegraph, under every varied mode of its operation.†

“Nothing is so easy as the discovery of yesterday; nothing so difficult as the discovery of today.”‡ This is a principle which Mr. Wheatstone either cannot or will not understand. He had been repeating during many years his experiments with his keyboards; yet he never altered them so as to adapt them to become parts of a reciprocal telegraph till I showed him how to do so; and now he only says, “Any one could have done it.” Perhaps so; but Mr. Wheatstone did not do it, and I did.

It appears then that the principle of combining, into one telegraphic system, two magnetic needles,

* For some unexplained reason, Professor Wheatstone never would adopt this arrangement, though so obviously convenient.

† Arbitration Papers, § 18.

‡ M. Biot, *supra*, p. 135.

included in the same metallic circuit, and moving simultaneously, one before the operator and the other before the recipient, on the passing of the current through the circuit; and with keyboards at the two termini, each fulfilling alternately the active office of originating the current, while the instrument is transmitting signals, and the passive office of forming a bridge for the returning current, while the instrument is receiving signals; this principle, I say, however simple, however undeserving of scientific approval, was the essential principle of Cooke and Wheatstone's Electric Telegraph of 1837, as it had before been of my telegraphs of 1836, and as it has since been of every other Electric Telegraph since contrived. That it was a new principle is virtually admitted by Mr. Wheatstone's unmeaning reference to Mr. Ronalds, and was proved, in a court of law, by the establishment, in an obstinate contest,* of the validity of the patent. Now this new principle was, by Mr. Wheatstone's own admission, not his invention. Therefore it was mine.

I proceed to explain how it happened that the dial and keyboard were described according to the peculiar forms shown in the drawings. The specification was drawn up by the late Mr. Farey, a gentleman recommended by Mr. Wheatstone, who placed the business in his hands. Mr. Wheatstone had been at work with him for some days before I was requested to attend, and he had,

* The Electric Telegraph Company, v. Brett and Little. *Supra*, p. 171.

perhaps not unnaturally, presented first to Mr. Farey's attention the peculiar forms of apparatus which he considered to be the representatives of his own share of the invention: though, as I urged upon him with great stress at the time, he committed a grave error, as a patentee and a man of business, in having the drawings made according to his old permutating key-board, which was superseded in the Euston Square experiments, and never appeared in any form again. The day for the enrolment of the specification had arrived. We had all been in attendance on Mr. Farey day and night,* and thirteen huge skins of parchment were already covered with writing. To describe my peculiar forms of the dial and keyboard, my intermediate and portable apparatus, and my mechanical telegraph, for which drawings† but no description had been prepared, would fill twice as many more. One important principle, which, like other inventions of mine, Mr. Wheatstone once claimed, but which he now leaves to me without contest,—"the return wire,—" I was most anxious to get into the specification. Mr. Wheatstone's "hatchment" form of dial, according to the drawing of it which he had caused to be prepared, only gave signals by the combined movements of two needles, not by the separate movements of the needles singly,

* Our account books contain, in Mr. Wheatstone's writing, a fee to our solicitor for three nights' attendance.

† I have Mr. Wheatstone's signature to a settlement of the expenses, including an item for "five sheets of drawings unfinished."

as in my Heidelberg Telegraph. I always felt, as experience has proved, that single-needle movements must, from their simplicity, supersede in practice any form of apparatus which would increase unnecessarily the number of needles employed, and double the resistance of the coils. A very warm discussion arose upon this point; I urging the great practical importance of the simpler arrangement, and Mr. Wheatstone objecting that it would spoil the symmetry of his dial. Convinced that I was right, Mr. Farey, on the last day, took from one of the drawings left unfinished, and added, in red ink, to the drawing prepared upon Mr. Wheatstone's instructions, an alternative illustration of an apparatus to work with a return wire. The detector having been squeezed in at the end of the last skin of description, and sketched endways in the last sheet of drawings, (from which sheet was cut off other matter drawn, but which could not be described in time,) the specification was acknowledged before Mr. Wheatstone's friend, Sir Giffin Wilson, one of the masters in Chancery, who had, at his request, kindly sat up for us, and was handed in at the proper office at a few minutes before midnight on the last day, to a clerk who had remained there to receive it.

To say that under these circumstances the forms of apparatus peculiarly belonging to me were left out of the specification because of their inefficiency, is incorrect to a degree inexcusable in a statement published after a year's consideration. Mr. Wheat-

stone knows, that whether the things omitted were good or bad, there was no choice in the matter; and that the omission took place, not after the description had been considered, but because it could not possibly be prepared. The patents having expired, I may now print facts, which under Mr. Farey's advice were excluded from the Arbitration Papers.

To make my further statement clear, I will divide it into two parts. First, I will speak of the Magnetic Needle Telegraph, and then the Mechanical Telegraph.

Our English patent was not the only patent for our first invention. We had patents also for Scotland and Ireland, a little later in date than the English patent.

After the English specification had gone in, time enough remained for the enrolment of the Scotch and Irish specifications more leisurely. Mr. Farey, therefore, added to the matter which had been enrolled in England, the drawings of those portions of the magnetic needle telegraph which had been left out, together with a suitable description of the instruments to which they referred, and some small further additions; and this additional matter, as well as the original matter, was enrolled at Edinburgh and Dublin as the specification of the joint invention comprised in our first Scotch and first Irish patents. The Irish specification was authenticated by Mr. Wheatstone's signature as well as my own to the description and to each of the drawings.

In the meantime I had taken out a second English patent, to fill up the gap which had been occasioned by the above-mentioned unavoidable omissions from the English specification.

The matter added to our joint specification for Scotland and Ireland formed the substance also of my second English specification, which is longer by four skins of parchment than the first English specification.

It is, therefore, not the matter contained in the first English specification alone, but the matter contained in the first and second English specifications, which really constitutes the invention of the Magnetic Needle Telegraph, for which our patent was taken out: an invention consisting essentially of my Reciprocal principle of communication, operating by Magnetic Needles.

The two specifications, taken together, represented two distinct forms in which the above-mentioned essential principle of the Magnetic Needle Telegraph (namely, my reciprocal principle operating by magnetic needles) might be embodied or applied: the Hatchment Instrument, founded on, and in connexion with, Mr. Wheatstone's permutating key-board; and the Two Needle Instrument, founded on my Heidelberg Telegraph of March 1836. For the moment, indeed, the necessity of linking the two descriptions together led Mr. Farey, who also drew up the second specification, to entangle my Heidelberg keys in the complications and double movements of the permutating key-

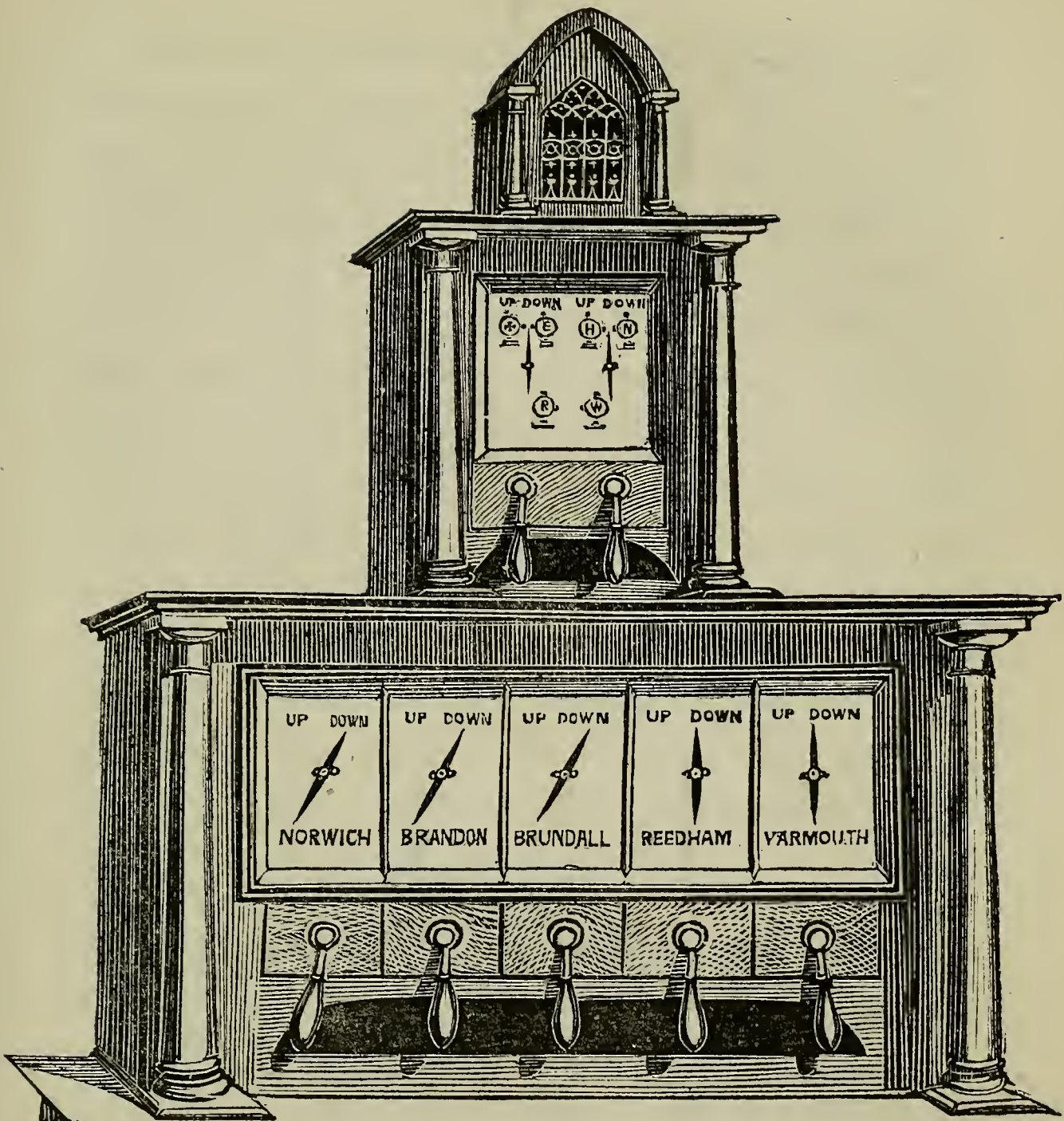
board, but in the first practical application of the telegraph, which took place soon afterwards on the Blackwall line, where practical simplicity was essential, I freed the Heidelberg key from this imperfection, by simply going back to the principle on which it was at first applied.

Now Mr. Wheatstone's "hatchment" instrument and the permutating key-board, to be seen at King's College and only there, have never come into practical use. Mr. Wheatstone reluctantly admits this.* On the other hand, my two-needle telegraph, with the Heidelberg key, as first applied, with my vertical handle, on the Blackwall line, is the telegraph now in practical use all over England.†

* "This instrument, though not now in operation on telegraphic lines, has not been discontinued on account of its inefficiency. . . . the sole reason that it is not at present in extensive use is the expense of the conducting wires, which renders it more advisable in a commercial point of view to employ instruments in which one, or two wires at most, are employed."—*Wheatstone*, p. 58, note.

"Un très grave inconvénient du premier télégraphe de M. Wheatstone était la multiplicité des fils; cinq fils, c'était beaucoup trop de complication et de dépenses."—*Moigno*, p. 89.

† "Tous les juges compétents s'accordent à dire que le plus excellent des télégraphes électriques, généralement parlant, est le télégraphe à deux aiguilles que nous venons de décrire. Quoiqu'il exige l'emploi de deux fils, il mérite la préférence dans le plus grand nombre des cas, à cause de sa simplicité, de son infailibilité presque absolue, de la facilité avec laquelle les manivelles se prêtent aux mouvements à exécuter, de la rapidité de transmission des dépêches, &c., &c. Aussi le télégraphe à deux aiguilles est-il, le plus universellement adopté en Angleterre. M. Bréguet nous a affirmé que s'il avait été libre, que si l'administration ne s'était pas cru liée par les antécédents du télégraphe de Chappe, il n'aurait pas hésité à installer



THE ELECTRIC TELEGRAPH

USED ON THE
YARMOUTH AND NORWICH RAILWAY,
WHEN OPENED AS A "SINGLE WAY,"

1st May 1844,

Showing the two-needle and the one-needle telegraphs,
with the vertical handle, viz. :—

The alarm at the top ;

The two-needle telegraph ;

Five separate single-needle telegraphs communicating
independently, by their simple signals, with five stations.

The alphabet of the single-needle telegraph is shown at
Page 190.

There was indeed something very taking in Mr. Wheatstone's hatchment dial. Its diamond form, and converging lines, quite eclipsed my unpretending arrangement. As an attractive exhibition of a new and untried principle of communication, for the approval of influential persons likely to take it up, it in some respects merits the praise which Mr. Wheatstone has bestowed upon it.* But, the dazzling confusion of its five needles, moving almost together, never could compete with the simple and rapid movements of the instrument which I proposed. In the law proceedings upon the first English patent, the chief ground of objection suggested by the defendants was the fact that the telegraph in the form specified—the hatchment dial and permutating keyboard—*had never been used*.

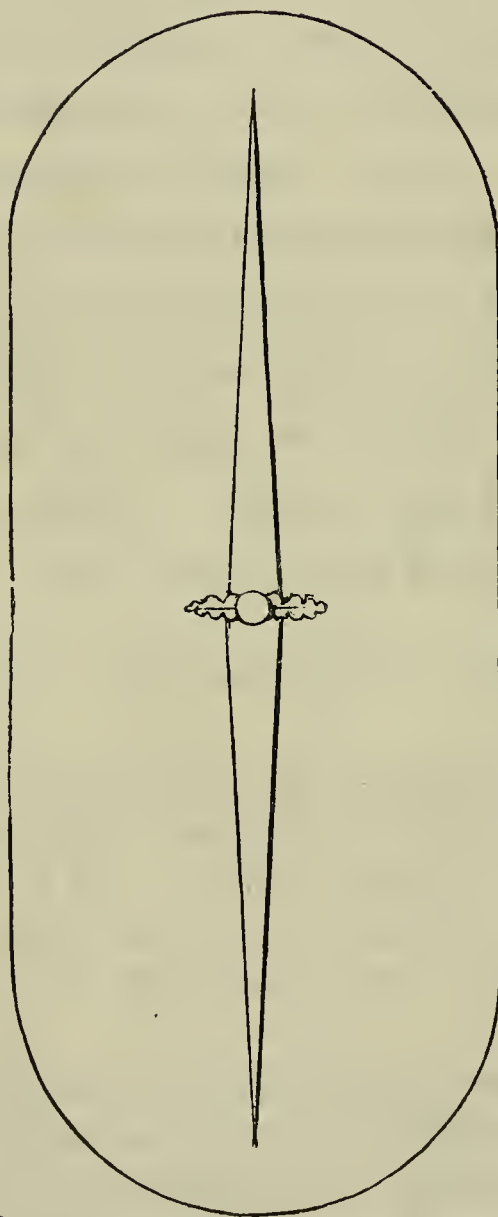
sur les lignes françaises le télégraphe à deux aiguilles.”—*Moigno*, pp. 391, 392.

The Abbé justly attributes to Mr. Holmes, formerly in charge of the instrument department of the Electric Telegraph Company, the invention of the “Aiguille-diamant;” and to Mr. Walker, of the South Eastern Railway, “les bobines mobiles aux disques circulaires;” both very great improvements in general use.—pp. 374, 377.

If from any cause one of the needles of the two-needle telegraph does not act, the other needle is used alone, and gives by a fresh combination of movements a full alphabet of signals. Where economy is an object, an instrument with a single needle, which I introduced at first for tunnels, is now used for general purposes; being in fact one half of the two-needle telegraph. Or rather, the two-needle telegraph should be viewed as a combination of two single-needle telegraphs. My Heidelberg Telegraph was, in fact, a combination of three distinct sets of single-needle telegraphs, each working quite independently of the other. *Supra*, p. 179. See also my dial for the one-needle telegraph, *infra*, p. 190.

* Wheatstone, p. 58, note.

+	A	B	C		M	N	O	P
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D	E	F		R	S	T		
\	//	///		✓	✓✓	✓✓✓		
G	H			U	V			
\	//			✓	✓✓			
I				W				
\				✓				
K	L			X	Y			
//	//			✓✓	✓✓			
WAIT	EXPRESS			SUBST. ^{TE}	REPEAT			



I	II	III	Γ	II	F				
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Γ									
SUBST ^{TE}									
			ΓΓ						
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									EXPRESS

ALPHABET OF THE SINGLE-NEEDLE TELEGRAPH.

But Mr. Wheatstone says—

“It was - - - the instrument of Mr. Wheatstone alone which was employed in the experiments made on the London and Birmingham Railway.”*

In the Arbitration he said—

“After I had succeeded in perfecting my magnetic-needle telegraph, - - - Mr. Cooke - - - went to considerable expense in constructing a magnetic-needle telegraph, which did not advance the subject.”† - - -

Which was answered as follows :—

“The telegraph here alluded to was Mr. Cooke’s second Galvanometer Telegraph, a correct history and description of which are contained in his case and drawings. It was made to be shown to the Solicitor General with Mr. Cooke’s mechanical instruments, as the complete practical instruments, for which the patent was to be obtained; and so far from its having been made after Professor Wheatstone had a complete telegraph, it was shown to the Solicitor General as a complete practical working telegraph, in May 1837, together with a pasteboard model of Professor Wheatstone’s diagram,‡ hastily made by Mr. Cooke for the purpose, very soon after Mr. Wheatstone invented it. - - - Moreover, Mr. Cooke’s second Galvanometer Telegraph and his mechanical instruments were at work alone at the London and Birmingham Railway before Professor Wheatstone had even a model instrument to add to them. Professor Wheatstone is most unfortunate in thus attempting, in the teeth of abundance of facts and evidence, to convince you that Mr. Cooke’s second Galvanometer Telegraph was made after he himself had ‘succeeded in perfecting his Magnetic Needle Telegraph;’ I shall disprove this assertion, most fatally to his credit, by a

* Wheatstone, p. 58.

† Arbitration Papers, § 317.

‡ Then horizontal; the vertical needle being a later idea.

letter of his own, and by a mass of other evidence. Let him, on the other hand, come forward with his mechanician's bills for "perfecting" his Magnetic Needle Telegraph, or rather for making a working model of it. I defy him to prove that he had anything deserving the name of a telegraph until after the date of Mr. Cooke's second Galvanometer Telegraph."*

The distinction between Mr. Wheatstone's instrument and mine, assuming my reciprocal principle as the basis of both, may be described as a distinction between duality and unity of action. Each of his simple signals was exhibited by "the convergence of (two) needles,"† deflected by a current overcoming the resistance of two sets of coils, produced by the depression of two separate keys, being terminations of two conducting wires, which were thus pressed down separately upon the metallic connections with the battery. On the other hand, each of my signals was exhibited by one needle, deflected by a current transmitted through a single set of coils, and produced by the movement of a single key or handle, turning on a horizontal axis; which, being a continuation, not of one conducting wire but of the two poles of the battery, produced the transmission of a current in the one direction by a single movement to the left, or in the other direction by a single movement to the right: the signal-man being enabled to transmit all his signals

* Arbitration Papers, § 650.

† " - - - Of my first telegraph the essential principles - - - are the formation of numerous circuits from a few wires, and the indication of characters *by the convergence of needles.*"—Wheatstone, p. 114; see also p. 56.

without relinquishing his hold of the two handles of his instrument; and his working being further facilitated by a constant parallelism of the position of the handles with the position of the pointers on the dial;* a great assistance to the beginner.

My instrument was not as Mr. Wheatstone suggests a simplification of his, but an independent development of the simple original principle of my earliest instrument. The telegraph of the present day consists of two of the three portions of my Heidelberg telegraph, of March, 1836, improved by Mr. Wheatstone's dry battery contacts, and his (or Baron Schelling's †) vertical needles; by my return wire; and by the adoption, from my mechanical telegraph, of March, 1836, of the self-acting draw-bridge or cross-piece for the return of the electric current.

As a further illustration of the distinction which I have been describing between Mr. Wheatstone's Hatchment Dial with its Permutating Key-board and the Two Needle Telegraph of the present day let it be supposed that two vertical needles had been applied to two of the circuits of each of my two Heidelberg instruments of 1836. My horizontal needles would thus have been replaced by vertical needles, and we should have obtained a reciprocal telegraph, giving, by two needles and two keys, eight simple signals exactly like those of the present day;

* The distinction above stated is a sufficient answer to Mr. Wheatstone's remarks in his note at p. 62: a mere repetition of a petty point completely answered by the Arbitration Papers, § 677.

† Supra, p. 174.

Mr. Wheatstone's instrument giving only two simple signals by two needles and four keys. Here, however, I should have required four wires against his two. But, in April, 1837, I introduced the improvement of the return wire, which, being common to the two needles, would have reduced the number of my wires from four to three. At a still later period, my plan of suspending the wires in the air, the subject of my patent of 1842, enabled me, by its improved insulation, to avail myself of the known conducting power of the earth itself* as a substitute for the return wire, thus

* The Abbé Moigno, in 1852, says, "Dans une note lue en Avril ou Mai, 1843, dans une réunion de la Société des Arts, M. Cooke, disait que, en 1841, il avait constaté par des expériences sur le chemin de Blackwall, que la terre pouvait remplacer pleinement la moitié du fil conducteur ou le fil de retour ("the return wire"). Voici textuellement ses paroles: 'La terre agissant comme un grand réservoir d'électricité, ou sous quelques rapports comme un excellent conducteur, la résistance offerte à la transmission du fluide électrique est grandement diminuée, et la pile peut agir à une bien plus grande distance avec un fil conducteur d'un plus petit diamètre.'"—*Moigno*, p. 244. I was not then aware that the discovery of this property of the earth was claimed by Professor Steinheil. Freely admitting his right to claim it for galvanic electricity on the principle laid down by M. Arago,—“qu'il n'y a qu'une manière rationnelle et juste d'écrire l'histoire des sciences: c'est de s'appuyer exclusivement sur des publications ayant date certaine;”—yet, our own countryman, Sir Wm. Watson, had proved, in 1747, by experiments across the Thames, and at Shooter's Hill, that the water and earth were excellent conductors, when, as the Abbé says, “Watson constata le 14 Août de la même année à Shooter's Hill, qu'un circuit formé de deux milles de fil de fer, et de deux milles de terre humide était franchi par l'électricité dans un temps inappréciable, insaisissable.” Aware of this fact, I was not surprised, when laying down in iron tubing the first telegraph on the Great Western Railway during the spring of 1838, to find that if the cotton covering of the conducting wires became abraded, or water gained admission to the pipe, the

reducing my three wires to two. I thus gradually imparted to my two-needle telegraph the capability of giving, by two wires and two keys, eight signals by simple movements, and an entire alphabet by combinations; while Mr. Wheatstone's instrument, in its original form, and as it has remained without further improvement at King's College, would, if reduced to an equal number of wires, only give, by a double number of keys, two simple signals. But it would be incomplete if deprived of any one of its five wires, or its five needles, or its ten keys.

electricity found its way from the pipe into the earth and so back to the detector. The usual practice was, therefore, to prove each length of the wires as they were introduced into the pipe, first with each other and then with the earth—"the earth" becoming thus a technical expression, still in use. The mode of "proving" the wire was, by connecting the detector (with a battery conjoined) by a wire, to the gas-pipe in the office at Paddington, which secured a good "earth-contact," and then by bringing each wire in turn into connexion with the other extremity of the detector-coil; but as when there was a strong "earth-contact," the current deranged the delicate needle then used, I usually employed a wire driven into the moist bark of an adjoining tree, which, being an inferior conductor, diminished the force of the current. In other parts of the line, a succulent weed, growing by the side of the railway, or the rail itself, was often used. It was not, however, till the extraordinary tide of 1841 threw down the boundary wall at Blackwall, to which the telegraph pipe was attached, and deranged the greater number of the wires, that I ventured, till the others could be replaced, to use the few which remained, in connexion with the earth as half the telegraphic circuit:—the gas-pipes of the offices again, as at Paddington, furnishing a ready "earth-contact." The telegraphic communication was thus restored, even before the retiring flood allowed the resumption of the traffic. When, in 1842, I took out a patent for suspending the wires in the air, I found the insulation sufficiently perfect to allow of the earth being employed for half the circuit; and I invariably adopted the practice on all future lines of telegraph.

The "Intermediate Telegraph"* was an essential part of my earliest plan, and still forms by far the greater portion of every telegraphic system. The frequent connexions and disconnexions with the general circuit, or with either terminus—the silencing and setting the alarum—the switch to divert the current to a branch line—were all parts of the Intermediate Telegraph; and it required a great deal of detail invention to effect the necessary changes by a simple movement of a lever or roller.

On the whole, then, what becomes of Mr. Wheatstone's claim to have been "the first contriver of the Electric Telegraph in the form which made it available for popular use?"† His contrivance was not the first which was available, and was never used except experimentally; nor did it become an electric telegraph at all, except by engrafting itself on my reciprocal system and adopting my alarum.

It was the single movement of the Heidelberg key—carrying with it both poles of the battery—opening the drawbridge in giving a signal, and closing it to receive a reply—producing "consentaneously and simultaneously at opposite extremes of the line,"‡ a corresponding single-needle movement before the operator and before the recipient, on the principle of reciprocal communication—the alarum, discharged by an electro-magnet—the intermediate arrangements—the detector—the practical insulation of the conducting wires—which composed my

* Cooke's specification of 1838, Repertory, vol. 11, N. S., p. 231.

† Wheatstone, p. 51.

‡ Ibid, p. 56.

first, as it does also the present form, of the Magnetic Needle Telegraph, "available for popular use."

Before leaving the Magnetic Needle Telegraph, I will glean one or two stray mis-statements of Mr. Wheatstone's, which alone remain to be answered.

He is incorrect in claiming priority in the "limitation of the motion of the needles - - - by fixed stops placed at the centre of percussion."* His "astatic needles," claimed at page 9, are not now in use.

He says, at the following page, that "his application of the theory of Ohm to telegraphic circuits enabled him to ascertain the best proportions between the length, thickness, &c., of the multiplying coils and other resistances in the circuit, and to determine the number and size of the elements of the battery† required to produce the maximum effect." To this claim I reply that whatever unpublished discoveries Mr. Wheatstone may be in possession of, the above-mentioned points, so far as they are now known in practice, have been worked

* Answered by Arbitration Drawings, Part H.

† "Pile à sable.—La plus simple de toutes les piles, la plus employée en Angleterre sur les lignes télégraphiques, est celle de M. Cooke. Une pile neuve montée avec soin peut fonctionner pendant six ou huit mois, si les dépêches ne sont pas trop multipliées; il en est qui ont fait un excellent service pendant plus d'une année."—*Moigno*, p. 322.

When I first directed my attention to the Electric Telegraph, the best battery would only remain in use for a few hours, and became rapidly weaker. I do not mention this battery as meriting any praise, but simply as a step in the "Practical" Telegraph.

out entirely by myself and other persons without any assistance from him.

I now proceed to the Mechanical Telegraph. This was not inserted even in the second English specification, and did not reappear till 1840. I will state how this happened.

The principle of the mechanical telegraph was thus stated in my Case on the arbitration.

“The principle of removing a detent by magnetic attraction, and replacing it by mechanical reaction, was not however confined to the Alarum, but on the contrary it was the basis of my mechanical Telegraph itself. The first idea of it suggested itself to my mind on the 17th March, 1836, during my journey from Heidelberg to Frankfort, when reading Mrs. Somerville's work on the Physical Sciences; and the Arbitrators will find that I immediately afterwards applied the idea to a musical snuff-box, being almost the only piece of mechanism I was then acquainted with. The striking advantage held out by the mechanical, in comparison with the galvanometer form was, that whereas the mode of giving signals by combinations of magnetic needles, each acted upon directly and separately by an electric current, involved the necessity of using several circuits, and consequently the expense of several wires; on the other hand, if the electric agency could be confined to the office of causing suitable interruptions or divisions in any kind of motion derived from an independent source, the necessity of a plurality of circuits would be avoided, for the diversity of the signals would then depend upon the mechanism.”*

This result was to be accomplished by means of an electro-magnet; and it was my inability to make

* Arbitration Papers, § 27.

the electro-magnet act at long distances, which first led me to Mr. Wheatstone. This scientific difficulty not having been overcome when the specifications of the earlier patents were under discussion, Mr. Farey advised a postponement of the mechanical telegraph—not as being inefficient in itself, for it was not so—but because its new and valuable principles were confined within a narrow limit of usefulness, by our ignorance of the laws of the electro-magnet.

Mr. Wheatstone's subsequent application of the theory of Ohm rendered the electro-magnet available for long distances. "I will repeat," said Professor Daniell, in his second letter before referred to,* "what I have already published in my 'Introduction to Chemical Philosophy,' viz., that your contrivances would have been of no avail for telegraphic purposes, without the investigation, which you were the first to make, of the laws of electro-magnets when acted on through long lengths of wire."

Mr. Daniell might have added that this investigation had not been commenced, or thought of, in March 1837: as appears by the silence of the publication of that date in the 'Magazine of Popular Science;'† confirmed by the omission of any mention of the electro-magnet in the summary of Mr. Wheatstone's discoveries in the Award. The origin of the investigation was thus stated in my Case in the arbitration:—

* Wheatstone, p. 84.

† Ibid, p. 51

“While my four simpler mechanical instruments were being made, I employed myself in trying experiments upon the Electro-magnet, with a view to discover at what distance an electric current would excite the temporary magnetism required for moving the detent of the mechanism. For this purpose, I adjusted above a mile of wire in the chambers of Mr. Lane, in Lincoln's Inn; but the magnets and battery being ill-proportioned, my experiments were unsatisfactory. In this scientific difficulty I sought the assistance of Dr. Faraday, who advised me to increase the number of the plates of the battery proportionably to the length of the wires; an expedient which in some degree overcame the defects of the magnets. I also consulted Dr. Roget upon the same scientific point; explaining my motives, but without showing my instrument to him.”

“Dr. Roget informed me that Professor Wheatstone had a quantity of wire at King's College which might assist me in trying experiments upon the electro-magnet, and he advised me on that account to submit my difficulty to him. Using Dr. Roget's name as an introduction, I accordingly called the same day upon Professor Wheatstone at his residence in Conduit-street.”* - - -

“On many occasions during the months of March and April, 1837, we tried experiments together upon the Electro-magnet: our object being to make it act efficiently at long distances, in its office of removing the detent. The result of our experiments confirmed my apprehension that I was still without the power of exciting magnetism at long distances; a defect which was to be attributed, as we then suspected, and as Professor Wheatstone's recent discoveries have proved, to the defective proportions of the magnets. In this difficulty we adopted the expedient of a secondary circuit, which was used for some time in connexion with my alarum.”†

* Arbitration Papers, § 46.

† Ibid, § 51.

Mr. Wheatstone having successfully concluded his "investigation of the laws of electro magnets when acted on through long lengths of wire," proceeded to construct the mechanical telegraph which he afterwards included in the patent of 1840. I regret to be obliged to lengthen my reply, by going into this branch of the subject; but as Mr. Wheatstone lays stress upon it, I have no alternative.

Referring to my Appendix for a full narrative, extracted from the arbitration papers, of the facts connected with the mechanical telegraph, I will here state the substance of them very shortly. About June 1839, "while engaged in my practical labours, I accidentally heard, through a scientific channel, that Professor Wheatstone had invented some new instruments." I called to see them, he being bound by our partnership deed to show them to me, and to throw them into the common stock. It was not, however, until after repeated postponements, extending over several months, that I obtained a sight of them; nor until he had extracted from me a promise to cede to him certain "separate privileges," consisting of domestic, and other minor applications of his new instruments. The instruments were at length shown to me. "Much as I admired the elegance of their form, I was astonished to perceive in them, —not the new and original invention I had been led to expect,—but an improved reproduction of my own mechanical arrangements." Feeling that I had not been treated with candour, I insisted on having our "relative positions in connexion with the in-

vention" ascertained and published, before granting the "separate privileges" in legal form.

Mr. Wheatstone did not derive much advantage from his unhandsome conduct. He had the "separate privileges" in his own hands for several years, and never could, at least never did, turn them to any account; and the patent of 1840, though supposed at its date to be of value, has expired, as already mentioned, without coming into use. I cannot conceive any honourable motive that could have led Mr. Wheatstone to represent the memorandum containing a provision relating to the "separate privileges" as the "substantial subject of the arbitration,"* which I refused, as he says, to confirm,† and which, as "the point of primary importance, was already gained"‡ before the signature of the Award.§ His own inconsistent admission|| that "the substantial subject of arbitration," as he calls it, "was even agreed to be postponed until the relative positions of the parties were defined," shows that his "point of primary importance" could not have been "gained" first; and if, by the way, it was, by his own agreement, postponed to the end, it could scarcely be considered a "point of primary importance." At all events, except on the question of costs, which was given in my favour, and on which a little more will be said presently, not a word of discussion took place, after

* Wheatstone, p. 75. See extract above, p. 160, *note*.

† Wheatstone, p. 73. ‡ Ibid, p. 79. § Ibid, p. 78.

|| Compare the conflicting statements at pp. 75 & 79 of his Answer.

“ the relative positions of the parties were defined” by the Award. That there was nothing to “ gain,” will be evident on the most cursory inspection of the terms of reference extracted below ;* which the Arbitrators had no power to alter.

“ In reply to Mr. Cooke’s proposal of an arbitration on the subject of their differences, Mr. Wheatstone,” as he tells us, † “ - - - wrote a second letter - - - demanding the arbitration, - - - and requiring that it shall be made binding by the proper legal forms.” Having thus disclosed his own “ animus ” ‡ in the enquiry, he proceeds to comment on mine in two pages of the details of my

* [*Second subject of Arbitration.*]—“ And whereas (*reciting the partnership deed*) and - - - the said C. Wheatstone claims, by virtue of an understanding of subsequent date - - - to be entitled for his separate benefit, - - - to certain rights and benefits, - - - in relation to certain parts and principles of the invention - - - secured by - - - the third - - - of the - - - English patents - - - dated the 21st - - - January last (1840): - - - *And whereas the said W. F. Cooke does not deny or dispute that the said C. Wheatstone is entitled to separate rights and benefits as aforesaid, but, on the contrary, he hereby admits and declares that he has promised to the said C. Wheatstone that he would grant him the same ; and he hereby admits and declares, - - - that he is now fully and irrevocably bound in honour, and that - - - he is ready and willing immediately to bind himself in law, to secure to the said C. Wheatstone, in the most effectual and satisfactory manner possible, consistently with a due regard to the general interests of the said joint property, - - - all such separate rights and benefits as aforesaid, to the full extent of the said W. F. Cooke’s promises in that behalf: NEVERTHELESS, the said W. F. Cooke - - - claims that every step - - - requisite for granting - - - such separate rights - - - should - - - be postponed and reserved until the relative positions of the said parties should, in the first place, by arbitration or otherwise, be ascertained and publicly notified,*” - - - &c.

† Wheatstone, p. 74.

‡ Ibid, p. 75.

“vexatious” proceedings. “In the first place,” he says, my solicitor “took upon himself to engage as third arbitrator a counsel of great legal eminence but unacquainted with scientific matters.” The subjoined correspondence* shows that my solicitor

*

1, Copthall Buildings, 4th Dec. 1840.

DEAR SIR,

Agreeably to your request, I waited this afternoon upon Mr. Starkie, and mentioned to him that you and Mr. Daniell wished to associate him with you, if agreeable to him, at the same time informing him that I had no authority to conclude the matter, but that I had been desired to ascertain his sentiments on the subject. He readily assented to be the third Arbitrator if called upon; and on my hinting, as you desired, that Saturday week had been mentioned between you and Mr. Daniell, he said that that day would suit him, and proposed ten o'clock, at his chambers in the Temple.

It now rests with yourself and Mr. Daniell to confirm the above arrangement; but as Mr. Wheatstone's solicitor feels some doubt whether his client's other engagements will admit of the statements of the parties being exchanged in the usual manner before that day, the appointment of Saturday week would, at present, be only contingent.

I should be glad, however, if the appointment of a day could be made even contingently, as a gentleman who will give some evidence on Mr. Cooke's behalf expects very shortly to leave London.

I remain, &c.

M. I. BRUNEL, Esq.

ROBT. WILSON.

4th Decem. 1840.

DEAR SIR,

I believe there will be no disinclination on the part of Mr. Wheatstone to meet on the day in question, viz., Saturday next. You had better, therefore, give the notice as if you were to act with the concurrence of all parties, and at Mr. Starkie's chambers, and at ten o'clock. This will suit Mr. Cooke's friend.

I am, &c.

ROBT. WILSON, Esq.

M. I. BRUNEL.

took nothing whatever upon himself, but merely made certain enquiries and conditional arrangements desired by the arbitrators and communicated to Mr. Wheatstone's solicitor.

Mr. Starkie, "the counsel of great legal emi-

1, Copthall Buildings, 5th Dec. 1840.

SIR,

I beg to hand you a copy of a letter which I have this morning received from Mr. Brunel, in which he directs me, on behalf of Mr. Daniell and himself, to conclude the appointment of Saturday next, at ten, at your chambers, to open the pending arbitration between the Patentees of the Electric Telegraph.

I fear there is some doubt, however, whether the written Cases will be exchanged before that time. I shall endeavour, however, to ensure you having an early intimation of the fact, in case it should appear necessary to postpone the first meeting for a few days.

I am, &c.

ROBT. WILSON.

THOMAS STARKIE, Esq.

1, Hare Court, Temple.

1, Copthall Buildings, 5th Dec. 1840.

MY DEAR SIR,

I have this morning received a letter from Mr. Brunel, in which he directs me, with reference to the conversation which took place between Mr. Daniell and himself, to close the proposed appointment of Mr. Starkie as third Arbitrator between Mr. Cooke and Professor Wheatstone.

As the simplest mode of executing my commission, I have written to Mr. Starkie, with a copy of Mr. Brunel's letter, adding a few words to my letter to meet the possible case of your not being able to exchange in time. I have also written to Mr. Brunel, to inform him of what I have done, and I now beg to enclose you a copy of the whole correspondence.

I am, &c.

ROBT. WILSON.

WM. RICHARDSON, Esq.

47, Bedford Row.

nence," was not a mere lawyer, but a man of comprehensive views, the author of a highly philosophic work on the principles of evidence; and I was desirous of seeing such a man appointed, in order that the evidence, (which, as soon as printed, Mr. Wheatstone was so anxious to destroy,) might be properly sifted, and not prejudged, as I had reason to fear it would be by a scientific umpire, according to a merely scientific estimate of its value. A court, combining the practical science of Brunel, the abstract science of Daniell, and the legal discernment of Starkie, could not have been objected to by Mr. Wheatstone, if he had wished to see the controversy finally settled by a decision upon its merits.

If there was vexation, it was not caused by me, but by those who, when they had learnt from my Case the weight of evidence against which Mr. Wheatstone had to contend, persisted in an attempt to force into our tribunal, without my consent and in opposition to my formal written protest, another of Mr. Wheatstone's scientific friends.

"In the next place, after the cases of the parties had been exchanged, Mr. Cooke took upon himself to engage a short hand writer."* This was done after communication with the Arbitrators and with Mr. Wheatstone's solicitor; and Mr. Wheatstone must have had a poor opinion of the justice of his cause, if he felt apprehensive of being ordered to pay for my short hand notes.

"Sir Isambard Brunel himself, in a letter to"

* Wheatstone, p. 75.

my solicitor, “distinctly recorded his disapprobation of the proceedings.”* The letter was as follows :—

Thames Tunnel, March 5th, 1841.

DEAR SIR,

There will be no meeting to-morrow. Mr. Daniell was quite dispirited at the sight of the papers that were produced, and Mr. Babbage would not take the office of Arbitrator if it were to take much time. In this dilemma, I have directed Mr. Law to make an exposition of the facts and evidences, in such manner as to be like debtor and creditor accounts.

Mr. Daniell concurs in this plan with me.

In a few days we shall be ready, and will then see you.

I would readily admit a short-hand writer, but we are all three alarmed at the complication that will result from the mode which you contemplate.

You shall hear from me in time.

I am, &c.

M^C. I^D. BRUNEL.

ROBT. WILSON, Esq.

It was this letter which led to the printing of the papers, in a form peculiarly convenient for reference, in pursuance of a recommendation from Sir Isambard Brunel, at a meeting which a memorandum of his on the subject proves to have taken place on the 9th March.

The very great labour which Sir Isambard bestowed on the investigation of the facts of the case fully entitled him to the benefit of any increased facility,

* Wheatstone, p. 76.

which, by adopting a usual practice where papers are voluminous, it might be in my power to afford.

The attempt of my solicitor to "represent the printing of this volume as required by the Arbitrators," exists only in Mr. Wheatstone's imagination, for neither my solicitor nor myself made any such representation. What was really said is contained in the following letter from myself to the Arbitrators which was printed as a preface to the volume.

To the Arbitrators.

GENTLEMEN,

As you consider the written papers laid before you by Professor Wheatstone and myself on the 27th ultimo, are likely, from their length, to occupy more of your time than you can conveniently devote to them, I have, at Mr. Brunel's suggestion, printed them entire, with marginal references.

I shall not regret the heavy expense thus incurred, if it prove the means of facilitating your inquiries into the facts and evidence on which I rest my appeal to you.

I remain, Gentlemen,

Your obedient Servant,

33, Upper Gower Street.

WILLIAM F. COOKE.

30th March, 1841.

I need not discuss the "form and spirit" of my solicitor's address, as the document itself is now submitted to the judgment of the Public. It was unavoidably severe, because consisting of an exposure of innumerable mis-statements and contradictions.

The matter printed was necessarily *ex parte* so far as it contained my solicitor's opening address without the proceedings which were to come after it; but Mr. Wilson fully explained to Mr. Daniell, in a letter of the 31st of March 1841, that the ulterior proceedings should be added in due time; and it cannot be said that I have shown a disposition to publish *ex parte* statements, when I have waited for months with my volume actually in type till I should be enabled to publish Mr. Wheatstone's answer along with it; and indeed not without a lingering hope that a withdrawal of disproved misstatements might justify me in suppressing a good deal of matter not very creditable to him.

I printed a thousand copies because I had learnt from Sir Isambard Brunel that there was a disposition, after my Case was out, to swamp the whole enquiry: and undoubtedly it was my intention, if the arbitration had been discontinued, to publish the papers far and wide. But the course which I then took was fully justified by the eventual decision of the Arbitrators on the question of costs. That question was not settled by agreement. I had proposed, in writing, "that all expenses incurred in this arbitration be considered as partnership expenses, and be deducted from the first proceeds of the invention."* Mr. Wheatstone and his solicitor refused to agree to this, urging that the question should be left to the Arbitrators. This having been conceded on my part, the parties were requested to leave the room,

* Cooke's Requisitions, § 7.

and the Arbitrators, after discussion, awarded payment of costs, according to my proposition. These facts are not stated from memory but from the solicitor's minute of the proceedings; and are placed beyond question by Mr. Daniell's acquiescence in the statements of Mr. Wilson's letter to Mr. Ward.* The Arbitrators decided that my expenses should be partnership expenses, or in other words that Mr. Wheatstone's share of "the proceeds" should bear half the expense, not merely of the half dozen printed copies which had been prepared for use, but also of the nine hundred and ninety-four copies which had been prepared provisionally for publication; and his account was charged accordingly with the cost of five hundred copies of the statements and of five hundred copies of the drawings; and also, I may add, with half the shorthand writer's bill. Mr. Wheatstone's statement,† that his expenses "were to be borne by Mr. Cooke until the inventions became profitable," is quite without foundation, for nothing of the kind was either done or ordered to be done. Mr. Wheatstone paid them himself.

It suits Mr. Wheatstone's purpose to assert that I "made proposals for an amicable arrangement." My letter to Mr. Daniell, of the 26th of April 1841,‡ and his letter to Mr. Wheatstone of the 24th of May 1843,§ prove that the suggestion of a compromise originated with the Arbitrators. But I should not have been

* *Supra*, p. 164.

† Wheatstone, p. 79.

‡ Cooke's Pamphlet, p. 18.

§ Wheatstone, p. 83.

backward in making proposals if I could have anticipated that all I required would be conceded to me.

Mr. Wheatstone observes in another place that my wish to be nominated to the Royal Society* “was indignantly rejected by the Arbitrators”—he must mean, by Professor Daniell, though Mr. Daniell’s very courteous manner to me, after he had read my Case, would lead me to disbelieve this. Sir Isambard Brunel was a party to my proposition before it was made, and would have nominated me himself. It seems to me that the practical introduction, in any sense, of an invention like the Electric Télégraph might have warranted my nomination for election into a scientific society. The same thing had been under consideration at an earlier period, as explained in the subjoined extract from the arbitration papers.†

* Wheatstone, p. 78, *note*.

† “ - - - - I frankly told Professor Wheatstone, that we never should go on cordially together till he yielded to me my rightful position, as the existing state of things induced on my part a constant and unavoidable suspicion of him; and I earnestly warned him that it might soon be beyond his power to do me justice without dishonour to himself. He assured me that he was extremely sorry that he had become involuntarily placed in the position in which he found himself, and we had a very long discussion as to the mode in which he was to recede from it: the difficulty which he seemed to feel most was, as he said, that I claimed more than half; that I claimed to be the sole projector, and also the joint and equal worker-out of the invention. I replied that I would be satisfied with a perfect equality, which was all I asked; urging that his scientific discoveries were an ample balance to my projection. I suggested, as the most gentlemanly and agreeable mode of publicly establishing our equality, that he should himself voluntarily nominate me for election to the Royal Society as co-inventor of the Electric Télégraph, on my finding another scientific man of high standing to

As regards what my solicitor wrote to Sir Isambard Brunel, I extract it at foot.* But it was tacitly understood that such a step would be too humiliating to Professor Wheatstone, in conjunction with the concession to me, by Award and agreement, of the whole of my demands.

My second charge against Mr. Wheatstone was stated in my first pamphlet, as a rumour upon

recommend me for my anatomical attainments. He replied that there 'would be difficulties,' which required that he should first speak to some of his friends. In a word, our conversation ended with a distinct and positive assurance on his part that he would put me in a proper position, that is, in a position of perfect equality with himself; but he did not promise to do so in any particular way: I left the mode to his own judgment as I had done on previous occasions."—*Cooke's Case in the Arbitration*, § 213.

* "I understand that Mr. Cooke expressed at the last meeting a wish to be nominated for election to the Royal Society. Should his request be acceded to, his election on the nomination of the Arbitrators and of Professor Wheatstone would perhaps be the best possible means of terminating the enquiry in a perfectly friendly way, and the publication of the statement (if agreed to) might take place very gradually by means of a limited number of copies distributed among private friends. But as it would be improper in me to enlarge upon a topic which is peculiarly one for the consideration of the Arbitrators themselves, I shall merely add that the papers sent were prepared upon the supposition of Mr. Cooke's request being acceded to (as we were obliged to act either upon one supposition or the other), and therefore if the Arbitrators or Mr. Wheatstone should think the request an improper one, some modifications of the concessions proposed to be made by Mr. Cooke might be necessary.

"PS.—I send Mr. Richardson copies of the papers with a copy of this letter." *Mr. Wilson to Sir Isambard Brunel*.—19th April 1841.

reliable information (though I was not permitted to mention my authority) in the following terms:—

“Mr. Wheatstone has allowed his friends to speak of the arrangements of 1845, as if, retaining at that time his original half share of the patents, he had received less than half the consideration paid by the Electric Telegraph Company for the purchase of them. There is here what lawyers call a *suppressio veri*; the truth being, that in 1845 Mr. Wheatstone had no share in the patents at all, but only a royalty, which he then parted with at his own price.”*

Mr. Wheatstone has now, in a definite form, avowed what is here alleged against him. I can now, therefore, bring the evidence to bear upon precise points.

At the beginning of the year 1843 we were at our lowest point of depression. The patents remained almost unproductive, and we had incurred, in various ways, a considerable outlay. I was still indeed hopeful, because a pamphlet,† which I had published at the beginning of 1842, had attracted the attention of engineers to the importance of the telegraph in connexion with a single line of rails. I had also just then introduced, under my patent of September 1842, the cheap system of suspending the wires in the air, which has since followed the Electric Telegraph all over the world.

But in the meantime further and increased outlay was indispensable. Having come to the conclusion that unless, with our own capital, we put up a specimen telegraph on the suspension plan, our dis-

* Cooke's Pamphlet, p. 41.

† “Telegraphic Railways” by W. F. Cooke.

appointments might be endless, I had already obtained from the Great Western Railway Company the privilege of putting up and working for a term of years a telegraph to Windsor. It had been proposed that Mr. Wheatstone should either find half the capital required for this Windsor telegraph, or cede to me as a "separate privilege" the right of putting it up on my own account. This I was willing to do in aid of the common enterprise, though I had no capital conveniently at command, and could not hope for a remunerative return.

Mr. Wheatstone's account was already, to some considerable amount, indebted to me. He declined (I do not say improperly, for it appeared that we had misunderstood each other on a collateral point) both my alternative propositions. What was to be done? To stand still was ruinous, and Mr. Wheatstone was not willing to move in the direction which seemed likely to open better prospects. Numerous meetings took place between us at the office of Mr. Wheatstone's solicitor, who, happily for my credit, was not then unwell.*

On the subject of the accounts which were eventually closed by the arrangement of 1843, Mr. Wheatstone makes the following remarks:—

"It was arranged that the accounts between the partners up to this date should be considered as settled, though no statement was furnished by Mr. Cooke, except that it was *greatly* in his favour. It is not material to the principal question, but Mr. Wheatstone has since ascertained either

* Wheatstone, p. 103.

that Mr. Cooke's representation to this effect was inaccurate, or that an item not taken into the account is still due from Mr. Cooke to Mr. Wheatstone."*

No official statement was furnished on either side, but Mr. Wheatstone knew the general state of the accounts as well as I did. My claims against him were for his share of the expenses of patents taken out, specifications, drawings, enrolment fees, and money advanced for instruments; with a heavy item for his share of my costs in the arbitration. He admits that there had not been any profits to set against these charges.† He was entitled to credit for his costs in the arbitration, of small amount; and, contingently, to a sum fixed by agreement as his share of the price of a licence to the Yarmouth and Norwich Railway Company; but as the agreement with that Company had not been confirmed by the Board,‡ and as the line could not be executed within fifteen or eighteen months, I allowed this licence to pass under the general royalty arrangement, instead of being set against the old balance. I have gone over all the papers in my possession without finding any clue to the mysterious (and, I believe, imaginary) "item not taken into the account."

In January 1843, it was definitively proposed, at an interview at Mr. Richardson's office, that Mr. Wheatstone should assign to me his share in the patents for a fixed royalty. Before proceeding fur-

* Wheatstone, p. 92.

† Ibid, p. 93.

‡ Infra, p. 217.

ther, I caused Mr. Wilson to write a letter to Mr. Richardson, communicating without reserve all the information in my possession; suggesting causes which might add to the value then put upon the patents; and throwing upon Mr. Wheatstone and his solicitor the whole responsibility of fixing their own terms, upon their own judgment. The great importance of this letter justifies me in printing it entire, and in requesting attention to every part of it.

1, Copthall Buildings, 13th January, 1843.

My DEAR SIR,

With reference to the conversation of this afternoon, on the subject of the proposed arrangement between Mr. Cooke and Mr. Wheatstone, Mr. Cooke wishes, for obvious reasons, to protect himself from all responsibility, and to prevent the possibility of future misunderstanding, by repeating in writing what he has already expressed verbally, viz., that Mr. Wheatstone must form his calculations independently, and be guided by his own judgment and yours in fixing the mileage which he would be willing to accept. Mr. Cooke will state equally independently, what he would be disposed to bind himself to give, and if there is any difference of opinion, it must be discussed; but it must be clearly understood as the basis of the negotiation that Mr. Wheatstone is not to be guided by Mr. Cooke's opinion, but by his own.

Indeed, Mr. Cooke has already explained to you that he cannot give any opinion which would deserve to be depended upon. He thinks the value of the patents for the Electric Telegraph depends entirely on the capital and energy with which they can be worked out, and the cheapness with which the work can be executed.

Mr. Cooke proposes the following data for your consideration.

On the Blackwall line, the charge for the license was £100 per mile for a distance of four miles or thereabouts.

On the Edinburgh and Glasgow line, the charge was only £100 for a distance exceeding a mile.

On the Leeds and Manchester, the same sum was asked but refused, and nothing was in fact paid for the license on that line.

On the Yarmouth and Norwich line, an agreement was made for a license at about £110 a mile to be taken in shares, in consideration of Mr. Cooke's becoming a considerable shareholder and paying the deposit on his shares before the bill was applied for, which deposit would have been lost if the opposition to the bill had succeeded. The charge for the license was found to be a serious difficulty, and the agreement, in consequence, has not yet been confirmed by the Board of Directors, who will probably require considerable modifications of it.

On the Croydon line, a proposed charge of £70 per mile was considered too high, and broke off the arrangement.

Difficulties of the same kind occurred on the Great Western.

The only estimate yet made of the value of the English patents was made when **** (friends of Mr. Wheatstone's) proposed to purchase a share. Mr. Wheatstone then named and Mr. Cooke approved £5000 as the price of a quarter share: and it was afterward arranged that the one-third share should be sold for £3300 in cash and £3300 out of the purchasers' share of the first proceeds. The purchasers were not required to produce any other capital; though their influence was considered of value. Upon this principle, if Mr. Wheatstone's half share were valued at £10,000, it would, after deducting Mr. Cooke's per centage for management, be worth £9000. This, you will recollect, was for England only, exclusive of the Great Western Railway

district. The Telegraph was then in high repute, and two years and a quarter of the patents have since elapsed; on the other hand, recent improvements have diminished the cost one-half, and the introduction of single lines may render a telegraph indispensable.

The subject of the conversation of this day was, as I understood, as follows. In consequence of Mr. Wheatstone having several times expressed, on recent occasions, a wish to withdraw* from all active interference in the patent business, and to leave Mr. Cooke entirely unshackled in his management, it was proposed that the patents for England, Scotland, and Ireland should be absolutely assigned to Mr. Cooke, he paying to Mr. Wheatstone a fixed sum per mile for every mile of telegraph laid down in the three countries under the patents, undertaking all legal and other expenses without contribution from Mr. Wheatstone, and releasing Mr. Wheatstone from the considerable claims which he now has upon him; all future improvements being included in the arrangement; the line from Paddington to Windsor by Slough not being subject to mileage; and a license being granted to Mr. Wheatstone securing his separate privileges within distinct establishments. The mileage in Ireland to be one-third less than in England, as the parties are only proprietors of two-thirds of the Irish patents.

I think we generally concurred this afternoon in thinking that if £50 were taken as the average price of one license with another, Mr. Wheatstone's mileage could not be fixed higher than £15. For his share of the £50 being £22 10s. only £7 10s. would remain to cover his share of Mr. Cooke's risks, and to liquidate his present claims, and remunerate the monied partner, if one could be met with. That is to say, there would be in fact only £15 in the whole to meet these contingencies.

* It suits Mr. Wheatstone to assert, that the agreement was concluded "*on Mr. Cooke's proposal.*"—*Wheatstone*, p. 92.

The question, then, for the consideration of all parties seems to be this. Whether £50 a mile be or not a fair average price for licenses in the three kingdoms. Mr. Cooke is clearly of opinion that the great diminution of the cost and difficulty of laying down the apparatus will require some considerable reduction, in most cases, in the price of the license. Even assuming that £100, or possibly above £100, might be obtained in some instances; there would be many other cases in which a very much smaller sum, or more probably an annuity terminable at any moment, would be all that could be hoped for. It is evident that in the case of a terminable annuity, Mr. Cooke might not even recover the £15 payable to Mr. Wheatstone.

It is obviously for the mutual interest of the parties that the mileage reserved to Mr. Wheatstone should not be so high as to interfere with the most extensive development of the invention; and certainly a high charge, whether greater or less than the sum specified, would interfere proportionably with its extension in the cases likely to be the most numerous, namely, those in which the payment will be made by annuity.

Should this arrangement be completed, Mr. Cooke's first object, after having finished the Windsor Telegraph, would be to get the Telegraph laid down on the Croydon or some other trunk line, even at prime cost, with the hope that it might be taken up and extended by the branches in a profitable manner. He openly declares that by a temporary sacrifice he hopes eventually to increase the value of the licenses, whilst he extends more widely the use of the invention. Should he be disappointed in his hopes, the risk will be his: to Mr. Wheatstone will be secured a moderate but safe return, which, under any circumstances, will probably be much greater, at all events for several years, than any profit which he can expect to derive from his share in the patents, under the present arrangement, and

while the tastes and occupations of one of the present partners prevent his entering actively into the business.

Mr. Cooke and I will meet Mr. Wheatstone at your office on Monday, at twelve, as proposed, and I trust that this letter, by fully and openly explaining Mr. Cooke's sentiments, will facilitate our arriving at a definite understanding.

I remain, my dear Sir,

Yours very truly,

WILLIAM RICHARDSON, Esq.

ROBT. WILSON.

P.S.—Mr. Cooke particularly requests that you will favour him by sending Mr. Wheatstone a copy of this letter, that he may weigh the points suggested for his consideration before the meeting on Monday."

It was after this letter that a continued and protracted negotiation terminated in the new arrangement of 1843; and it must have been with this letter before him, that Mr. Wheatstone penned his insinuation, that the transaction to which it relates was one of a series of "steps invariably legal" "in the approximation" to a fraudulent result. And here I shall leave the arrangement of 1843, with the assurance that no man of honour, however much prejudiced in Mr. Wheatstone's favour, will rise from the perusal of these pages, without feeling that Mr. Wheatstone, in wantonly imputing to me unworthy motives, with such a document as the above letter under his eye, has committed a grave moral offence.

The business progressed exactly in the manner which had been anticipated. I laid down a telegraph to Slough, on which, as it was intended as an

illustration of the new system of suspension, no royalty was made payable. I then proceeded, as proposed, to lay down a trunk line, selecting the line to Portsmouth in consequence of the opening presented by the arrangement with the Admiralty. This was effected partly, though by no means exclusively, through Mr. Wheatstone's influence; and in consequence of the assistance he had given me, I offered him an equal share with myself in the undertaking; an offer which he entertained, but of which he could not eventually avail himself. The works were executed by the railway company and myself in partnership, each finding half the capital for the telegraph; but the whole of Mr. Wheatstone's royalty, amounting to upwards of £1500, was thrown as a separate burden on my share and was paid to him by me. Subsequent experience has verified my expectation that the rates of license would fall, and would assume the form of annuities; and long 'ere this, if the agreement of 1843 had remained in force, the rates fixed by it would have become prohibitory unless revised under the last clause of the deed to which Mr. Wheatstone refers.* He handsomely supposes some improbable cases in which I might have taken advantage of my position to his detriment; which need not be discussed as they never arose.

Mr. Wheatstone sees fit to infer that my sale of the patents necessarily involved a contemporaneous purchase of his royalty, but so far from this having

* Wheatstone, p. 95.

been the case, my proposals were always based on the supposition that the royalty would continue to be a charge on the patents in the hands of their new proprietors.

Thus, a statement which my solicitor drew up as early as 1843, to be handed to a gentleman with whom a negotiation was then pending, commences with a list of the patents; the licences already granted; and the lines, finished, on hand, and in prospect; and concludes as follows:—

“ Mr. Wheatstone's royalty would be a charge upon the joint property. Its amount is as follows:—

For the first ten miles of Telegraph laid down every year	£20 per mile.
For the second ten miles	£19 per mile.
For the third ten miles	£18 per mile.
For the fourth ten miles	£17 per mile.
For the fifth ten miles	£16 per mile.
For each mile beyond fifty miles	£15 per mile.

Mr. Wheatstone has also a license for the use of the inventions for certain domestic and other purposes, limited to distances of half a mile as the extreme extent of his communications.”

The speculative year 1845 gave rise to new negotiations for purchase of the patents, with a view to the formation of a company, but still subject to Mr. Wheatstone's royalty, which was exhibited in a schedule, similar to the above, brought down to the day; and it was by the request of the gentlemen who had proposed to join me, that I enquired

whether Mr. Wheatstone would be disposed to sell, and on what terms.

Mr. Wheatstone has referred to a letter of mine of the 31st July, the result of a conversation on the previous day, when he had requested me to make a definite proposition in writing. I set out the letter below, and Mr. Wheatstone's reply. I certainly see nothing in this correspondence to justify his charge of "bargaining;"* but the reader can judge between us. I simply reported Mr. Wheatstone's terms to the promoters of the company, and left the option of purchase to their consideration: it being a matter of perfect indifference to me whether they purchased his royalty or not.

The correspondence was as follows:—

" Kidbrooke, near Blackheath,
July 31st, 1845.

" MY DEAR SIR,

The proposition I made to you yesterday for the commutation of your royalty over a large portion of England and Wales may be comprised in the following question:—For what sum paid down now will you commute your royalty over the whole of England and Wales lying north of the Thames from its mouth to London, and north of the Great Western Railway from London to Bristol, but not including the railway itself, which will remain subject to your royalty? Say the cash to be paid half within three months, and the remainder within six months more?—I have also to ask you, as a distinct proposition, whether you will accept of the sum of £20,000 as commutation of your royalty for England, Wales, Scotland and Belgium, and

* Wheatstone, p. 96.

your share in the Irish patents—and also including the exclusive rights in Great Britain and Ireland, but not in Belgium,—£10,000 to be paid in four months from this date, and £10,000 six months later?

I am, yours faithfully,

WILLM. F. COOKE.

P.S.—The latter proposition to include all cash settlements pending between us at the present time. As you are, I believe, connected with others in the ‘exclusive rights,’ you can add £1,500 in addition to the £20,000 on that score.

CHARLES WHEATSTONE, Esq.”

“20, Conduit Street, August 2, 1845.

MY DEAR SIR,

I have thought over your propositions, and after due consideration have arrived at the following conclusions. I will commute my royalty on *all* lines in England (and Wales) for the sum of £20,000, the royalty on lines completed before the payment of the first instalment of £10,000, to be paid to me under the present arrangement. The grounds of my calculation are these: 1st, that thirteen railway lines, averaging 100 miles each, would realize to me the above sum: 2ndly, that at the rate even at which lines have been completed during the first six months of the present year, the sum I have named would be realized in four, or at the utmost, five years: circumstances may augment or diminish this income, but I consider the chances of increase and decrease equal: 3rdly, that whatever arrangement be made for the sale of the Patents to other parties, the agreement with them cannot affect lines established previous to the date of such agreement.

If the Great Western Railway, and the portion of

England south of this line and the Thames be excluded, I would fix the commutation at £16,000.

I will for a further sum of £10,000 give up all my rights in Scotland, Ireland, and Belgium, with all my reserved rights under the English Patents;* or I will make a separate arrangement for any one or more of these privileges.

I wrote by last night's post to M. Quetelet, to ask when he leaves Brussels, and when he returns; if it be possible to arrive there a few days before he leaves, I will start directly; but it will be of no use for me to be in Belgium when my most influential friend is absent.

Yours faithfully,

C. WHEATSTONE.

W. F. COOKE, Esq.

P.S.—These propositions to be of no effect unless agreed to within a month from the present date.

C. W."

“Some further correspondence took place on points of detail, but the terms themselves were in all points of substance agreed to as at first proposed in Mr. Wheatstone's letter. He received the £30,000 which he asked, together with all arrears of royalty.” †

Mr. Wheatstone alleges, ‡ that “he was not even treated with ordinary fairness, which is taken to im-

* To show how difficult it was to form any accurate estimate of the value of the Patents, I may mention that the whole of the amount paid for the Scotch and Irish Patents was a loss to the purchasers. The Belgian Patent, and the “reserved rights” have also been entirely unproductive.

† Cooke's Pamphlet, p. 45.

‡ Wheatstone, p. 90.

ply open and candid dealing." Here, at least, is a plain charge, made in plain language; and I will endeavour to be equally explicit in my answer to it.

In the first place, is there any foundation in fact for his assertion* that he was kept in ignorance of "the increased rate at which profits were accruing," until "he had parted with his royalties?"

His words are:—

"Mr. Wheatstone - - - received in royalties on the operations of - - - 1845, £2775; - - - but the account - - - was not rendered by Mr. Cooke till after the date of an agreement presently to be mentioned; and before, therefore, Mr. Wheatstone was fully cognizant of the increased rate at which profits were accruing, he had parted with his royalties on the terms vaguely described in Mr. Cooke's pamphlet." †

The account, of which Mr. Wheatstone here professes to have been kept in ignorance, credits him, for eleven months of the year 1845, from the 1st January to the termination of the royalty arrangement on the 27th November, with £2,775, as the royalties on 175 miles.

Mr. Wheatstone's letter of the 3rd August, fixing his terms, and printed above, states the grounds of his estimate of the value of his royalty in the following words:—

"The grounds of my calculation are these: 1st, that thirteen railway lines, averaging 100 miles each, would realize to me the above sum: 2ndly, that *at the rate even at which lines have been completed during the first six*

* Wheatstone, p. 96.

† Ibid.

*months of the present year, the sum I have named would be realized in four, or at the utmost, in five years: circumstances may augment or diminish this income, but I consider the chances of increase and decrease equal.**

Now as 1,300 miles in four or five years would give as the lowest yearly average 260 miles a-year, while the business of 1845 only reached 175 miles for eleven months; it is evident from Mr. Wheatstone's own letter that he was *not* kept in ignorance of "the rate at which profits were accruing," although the account for 1845 (due at the end of that year) was not and could not be formally rendered till after the date at which he agreed to sell his prospective right to royalty.

The manner in which Mr. Wheatstone may have become possessed of the grounds of his calculation appears by an incidental disclosure, in another letter to which he has referred, of the "open and candid" nature of my communications to him.

The negotiation which was in progress at the date of the former correspondence had gone off, but a new opening had presented itself for disposing of the patents.

The new purchaser was not to be in London till November, and the option of purchase which Mr. Wheatstone had granted to me (the original period of which had already been extended) would expire on the 4th October.

I had been fortunate enough to conclude an arrangement for the Dover Railway, the most im-

* *Supra*, p. 224.

portant and profitable telegraphic line in the kingdom. Did I simply ask Mr. Wheatstone whether it would be agreeable to him to allow me another month? Perhaps as a man of business I ought not to have said anything to disturb an arrangement already made: but, as during the negotiations of 1843 I went out of my way to communicate to him * every fact within my knowledge likely to influence his judgment even to my own prejudice, so, in 1845, I began my application for further time by telling him of my own accord that I had secured the Dover line. The letter was as follows:—

1, Copthall Buildings,
September 15th 1845.

“MY DEAR SIR,

I have received an order for the Dover line, a circumstance very much in favour of the immediate formation of a Telegraphic Company. As I have not received your answer to a letter written last week, I conclude you are from home, and probably still on the Continent. I will therefore briefly repeat the substance. The arrangements I am making for the sale of the Patents are not sufficiently advanced to admit of their being completed by the 4th October, the day to which you limited me in your letter of (or about) the 4th August.

Before I commit myself so far, I require your consent to the extension of the period for which you have given me powers for the sale of your Royalty in England and Wales, or in part. This period ought to be extended at least to the 15th November, when the commercial world will again be assembled in town, &c.

Yours truly,

PROF. WHEATSTONE.

WILLM. F. COOKE.”

* By Mr. Wilson's letter to Mr. Richardson, *Supra*, p. 216.

The above letter, so strangely brought forward as evidence against me, proves that there *was* “that explicit dealing on the part of Mr. Cooke, which Mr. Wheatstone’s relations with him might have led him to anticipate.”* The same letter shows also that the intended formation of a company was mentioned to Mr. Wheatstone without reserve; and I may add, without inconsistency between this mention of a company in a letter of my own and the mention of my “new partner” or my “friends” in letters from my solicitor.† I was forming an agreement of partnership with one capitalist, as the representative of himself and another, with a view to operations under a partnership deed until an act of parliament could be obtained to incorporate a company: Mr. Wheatstone’s interest passing, *pro formá*, through me to the partnership; and from the partnership, after the passing of the Act, to the Company. The mode of transfer was decided upon, and the deeds drawn, by the purchaser’s counsel.

In concluding this subject, I may observe that although I did not go out of my way to repose in Mr. Wheatstone a degree of confidence, which his conduct in the arbitration had necessarily forfeited, the arrangement I was making was in every step of its progress laid open to several honourable men of business experience and high standing; and the fact of my still enjoying their undiminished confidence and esteem is a sufficient answer to any imputation from Professor Wheatstone.

If then there was no concealment, and especially

* Wheatstone, p. 101.

† Ibid, p. 100.

if (as I have shown) gratuitous information was afforded on points affecting the value of the royalties, Mr. Wheatstone would have no just cause of complaint, even if it were true that I had thought fit to ask for myself a higher proportionate price than that which he thought fit to ask for his separate interest. Let it be remembered that for two years our common interest had entirely ceased; that the patents were exclusively mine to deal with as I chose, subject only to a fixed royalty on the work annually executed. The long letter which preceded the arrangement of 1843 shows that it was Mr. Wheatstone's wish, not mine, which led to his retirement*; that he parted with his share of the patents upon the fullest information that I could give him; on terms fixed by himself and his solicitor; after a caution on my part that I disclaimed all responsibility for his decision, and an open avowal of my intention to make the patent property more valuable, if I could, by increased energy and outlay.* I afterwards laid out, independently of other large expenses, at least £10,000 further capital, on telegraphs remunerative only in prospect. I paid to Mr. Wheatstone, out of my own private means, more than £1,500 royalty on the Portsmouth telegraph. It was my invention of the system of suspension, to which Mr. Wheatstone never laid any claim, and which reduced the expense of a telegraph something like 60 or 70 per cent., which at length crowned

* Mr. Wilson's letter to Mr. Richardson, *Supra*, p. 218.

my labours with success. The active speculation in the year 1845, coinciding with the advantageous contract for the Dover line, and other opening prospects, raised the value of the patent property to an unexpected height. Now, if under these circumstances I had sold, ever so advantageously, the patent rights which by Mr. Wheatstone's request I had taken over, and my highly remunerative engineering department, why should Mr. Wheatstone have grudged me a well-merited and long-deferred reward for my perseverance and enterprise? I was not buying him out, in order to resell his rights at a profit. I was the owner of the patents, subject to a fixed encumbrance. I offered them for sale, subject to the burden, at a price mainly estimated on works in hand and in prospect; and it was the purchaser from me, not I myself, who offered to buy the royalty. I was not, as the Professor represents, an agent of his. I had no interest in the matter, except so far as the terms of purchase might affect, in some trifling degree, the value of the shares which I was afterwards obliged to take in the Company. I conclude, then, that I had a right to ask what I pleased as the price of what belonged to me, and that Mr. Wheatstone has no right to make comparisons between his price and mine, or to call upon me to enter into any explanation on the subject.

But I have no objection to give the fullest explanation. The disproportion which I have assumed, for the sake of argument, had no real existence.

Mr. Wheatstone was paid in a higher ratio for the prospective benefits of his royalty, than I was paid for the prospective benefits of the licenses, and of the extensive and lucrative contracting business, which my invention of the cheap mode of insulating the wires by suspension had enabled me to establish. In order to show this, I must first state certain private matters, which I would not unnecessarily have obtruded on public attention, viz., what the purchase money amounted to, what deductions were made from it, and how the balance was paid.

At the date of the sale I was actually out of pocket, on the operations of the ten preceding years, after crediting the account with all unused stores £14,908

Of this I received back as the purchase money of my share in the Portsmouth and Great Western telegraphs £10,000

Leaving a deficiency of . . . £4,908

Of which upwards of £1,500 consisted of royalty paid to Mr. Wheatstone on the Portsmouth telegraph.

The price paid by the Company for the patent property was £150,000

Less a contingent amount which had been put down as the estimated value of a line for which I was then negotiating, but which was not ob-

tained, and for which, therefore, the Company made me no payment	8,600
	<hr/>
Leaving	£141,400
Of which Mr. Wheatstone asked and received	£30,000
The Irish partner	5,217
Sundry other payments out of the purchase money, the details of which are known to the Directors, including part purchase of a patent for the Company	10,117
	<hr/>
	45,334
	<hr/>
Leaving for me	£96,066
From which must be deducted my de- ficiency, as above, of	4,908
	<hr/>
Leaving net	£91,158
	<hr/>

The above gross amount of £96,066 was paid as follows:—

In cash	£2,566
Out of profits when made, which payment was not completed for four years	48,000
In 1820 £100 shares, the sale of which was, during several years, prohibited; and which, being paid up only to £25, were subject to	

further calls to the amount
of £136,500, the whole
of which has been since
called up and paid . . . 45,500

£96,066

In consideration of which payments, I
was bound over to guarantee the
Scotch and Irish patents, in certain
events, to the amount of £6,666

And I bound myself to serve the Com-
pany gratuitously, which I did for
several years.

It appears then that Mr. Wheatstone received in
1844 and 1845, in cash :—

Royalties of 1844	£444
„ 1845	2,775
Purchase money	30,000
	<hr/>
	£33,219
	<hr/>

Against my receipt in shares and future
profits, subject to most serious liabi-
lities, and to an obligation of gratui-
tous service, of £91,158

Taking the aggregate of these two sums, namely,
£124,377, as the purchase money of our united
interests sold to the Company, I will first consider
how this total should have been apportioned, under

the original agreement of 1837,* between the goodwill, capital, and exclusive engineering rights of the business on the one side, and the patents on the other, if the agreement of 1843 had not been made. Mr. Wheatstone correctly quotes my evidence when he states that my "share of the patent rights had been less profitable than my employment as a contractor." Let it even be assumed that the two were equal. The purchase money would then be divided into thirds; which would have given Mr. Wheatstone for half the patent £41,459, paid as follows:—

One-third of 1820 shares, liable to calls as above, say . . .	£15,000
One-third of the amount paid out of profits in four years . . .	16,000
In cash	10,459
	£41,459
Less my 10 per cent. for management	4,146
	£37,313
Leaving for Mr. Wheatstone	£37,313
With a liability on the Scotch and Irish patents to the extent of	£2,222.

Thus £37,313 in cash and securities, subject to liabilities, would stand against the £33,219, which Mr. Wheatstone received in cash. Which would

* I do not add to the £124,377 the £4,908, deducted, at page 102, from the gross purchase money; because an outlay exceeding that amount was caused by the agreement of 1843; which agreement on my present supposition, would not have been made.

he have preferred if he had had to choose between the two?

My share—in amount nearly equal, and in the mode of payment greatly preferable, to what I really obtained—would have been as follows:—

Patent right	£41,459
Engineering business	41,459
10 per cent. management	4,146
	<hr/>
	£87,064
	<hr/>

To be paid:—

In cash	£21,464
Out of profits	33,600
To be taken in shares	32,000
	<hr/>
	£87,064
	<hr/>

Secondly, I will assume, as the ground of an independent comparison, the letter to Mr. Wheatstone's solicitor,* on which, with unessential modifications,† the royalty arrangement was founded.

This letter assumes an average price for licenses of £50 per mile, in the proportions of £15 for Mr. Wheatstone and £35 for myself.

A simple rule-of-three sum will then give this result — As £15 : £35 :: £30,000 : £70,000.

£30,000 to Mr. Wheatstone, supposes a grant of licences for about 2,000 miles, and consequently

* *Supra*, p. 218.

† It will be observed that the scale above £15 a mile only applies to fifty miles in each year, and could not have added to the year's royalties more than £150, beyond what they would have come to at a simple charge of £15 per mile throughout. *See the scale: Cooke's Pamphlet*, p. 43; and *Supra*, p. 222.

an equal extent of contract work: for the railway companies, at that time, invariably made it a condition that I should contract for the completion of the works and for their maintenance (on terms which proved highly beneficial) for six or twelve months.

2,000 miles, at £22 per mile, or 15 per cent., an amount below the average profit, would have yielded £44,000; which, together with patent right as above, should have yielded me £114,000; all in cash.

I will add one more calculation founded on Mr. Wheatstone's statement* that "had Mr. Cooke - - - sold the patents, subject to Mr. Wheatstone's royalties - - - the latter would have acquired by the end of 1853 upwards of £70,000." This is not a fair supposition, being founded on the results of the unfettered operations of a great Company. The supposition ought to be the attainment, under the agreement of 1843, of the same result without a sale: when our comparative profits would have stood thus:—

As £15 : £35 :: £70,000 : £163,333

Being the result of about 4,600 miles,

yielding at £22 per mile for contract 101,200

Or a total profit to me of £264,533

And this amount ought, according to Professor Wheatstone's views, to have been paid in cash, as well as his own £70,000. For says he:—

"It is to no purpose that he further excuses the disproportion by stating that the patents were his speculative

* Wheatstone, p. 102.

property. Their value had been fairly tested; and if he chose to lay down certain lines, partly with his own capital, he did so safely and with the certainty of profit. If he confined himself, on the other hand, to his legitimate business as a contractor, it was in no sense more speculative than the royalties of Mr. Wheatstone. Both were speculative, in as far as the income arising from either might be indefinitely increased with the increase of operations. But the risk was none if Mr. Cooke confined himself to contracts at definite and remunerative prices, and there was no lack of these, or of a very ample '*margin*,' after payment of all the royalties due to Mr. Wheatstone."*

So that I ought to have received, from 1845 to 1853, £33,000 a-year in hard cash.

I must dwell for a moment longer on this subject, even at the risk of tediousness; feeling sure that whatever other differences may unhappily exist between Mr. Wheatstone and myself, his remarks on these money transactions are founded entirely on misconception.

I have shown that the net purchase-money was not nearly so large, even in nominal amount, as he supposes, and that the mode and conditions of payment were equivalent to a large further reduction.

As regards my subsequent calculations, the reader may agree with them, or differ from them, in points of detail; but I wish to bring clearly and forcibly before him that he cannot differ from me on the question of principle involved. The fact must be recognised that, by the agreement of 1837 be-

* Wheatstone, p. 102.

tween Mr. Wheatstone and myself, I had been established, in the most deliberate and solemn manner, as originator of the undertaking, in the exclusive possession of the engineering department, including “all the benefits arising from the laying down of the lines and the manufacture of the instruments,”* and that out of the separate and exclusive rights thus secured to me, in my character of originator,—and by the entire devotion of ten of the best years of my life,—and by an outlay, to a considerable amount, and at no inconsiderable risk, of capital which I could ill afford to lose,—and by means, too, of my separate invention of the system of suspension, which was the main cause of my ultimate success,—I had gradually built up a most valuable and lucrative business.

Whether, then, on the score of a legal right, conferred by one arbitration, and confirmed by another, and recorded in a partnership deed; or on the ground of what was fair, or on the ground of what is usual;—under any possible aspect of the case, I am entitled to consider my telegraphic business—exclusively mine by right, and not by sufferance—as having justly represented, as in estimates laid before the purchasers it really did, a large proportion of the money paid. It is true, that “it appeared, from the deed by which the patents were assigned, that they were the sole consideration;” and legitimately, indeed necessarily so, because, as Mr. Wheatstone very properly adds,

* *Supra*, p. 141.

“the value of his (my) business, as such, was derived principally from the possession of the patents.”* The patents, when assigned as a whole, included, in law and in fact, all the “separate privileges” derived out of them in favour of either party; just as the freehold of an estate includes the right of cultivating it, or of building on it. But I fearlessly maintain that, looking at a large question largely, a man of business, acquainted with such matters, will find in the figures above stated a decided disproportion in Mr. Wheatstone's favour, and not any against him.

Every one knows that it is usual, as it is also just and necessary, even in the most ordinary commercial undertaking, and much more therefore in the laborious and hazardous business of introducing a new invention into general use, to allow a large share of benefit to the man who gives up his time and risks his money. Mr. Wheatstone and I jointly acted on this principle when we gave up a half share in the American Patent, and afterwards, when we gave up a third share in the Irish Patents, to partners who, without giving time to the business, only paid the expenses of taking them out.

Though I have not thought it necessary to go into every little uninteresting point, already refuted in detail in the Arbitration Papers, I think I have sufficiently disposed of almost every thing worth noticing in Mr. Wheatstone's Answer, except the

* Wheatstone, p. 102.

subject of his engagement to give up to the proprietors of the patents the benefit of any improvements which he might make on the patented inventions; and the subject of his appointment, as scientific adviser and assistant of the Electric Telegraph Company.

His statements are to the following effect.* “On October 17th, 1845, Mr. Wheatstone received notice - - - that Mr. Cooke would ratify the conditional agreement of October 4th. At this date the royalties and rights of Mr. Wheatstone, under the deed of April 1843, were alone included in the agreement - - - In December 1845, the necessary deeds of transfer in pursuance of this agreement were executed; but in these were included assignments to Mr. Cooke of past and future patents for England and Wales to a further extent than was contemplated by the agreement. - - - Mr. Wheatstone’s royalties would have ceased in 1856. - - - All patents already existing, which should not have expired in 1856, would have remained the joint property of Messrs. Cooke and Wheatstone, but for these - - - assignments of December. By these they became the unconditional property of Mr. Cooke. Mr. Wheatstone was simultaneously bound to - - - assign all future improvements - - - until 1859 - - - *A consideration for this had already passed - - - expressed in a memorandum,*” dated the 3rd October.

If Mr. Wheatstone could have asserted that *after* the signature of the agreement of the 4th October,

* Wheatstone, p. 103.

and before the signature of the "necessary deeds of transfer" in accordance with it, a memorandum was made of some new concession on his part, in consideration of which the assignments went beyond the agreement, there might have been some weight in his argument; but unluckily, the dates show that *the memorandum* of the 3rd October *preceded the agreement* of the 4th October. What he asserts, therefore, is, that an important arrangement, made on the 3rd October, *but not mentioned in the memorandum of that day*, (written down and signed at the time for the express purpose of recording what was arranged) was also left out of the agreement of the 4th October, in order that it might be expressed, for the first time, two months afterwards, in the formal assignments founded on that agreement; in which assignments the alleged consideration is not expressed after all!*

Mr. Wheatstone, at p. 103, expresses his regret†

* *Infra*, p. 249; and Wheatstone, p. 105.

† "Mr. Wheatstone apparently had reason to regret a circumstance, stated in his letter to Mr. Cooke (Mr. Wilson) of September 17th (18th), 1845, that on account of the ill health of his solicitor he had been unable to consult him for a year, which included the time during which Mr. Cooke was negotiating the substance of the terms acceded to. For the deprivation of this protection Mr. Wheatstone is of course aware that Mr. Cooke is not answerable, nor does he on this part of the case set up any claim or complaint against him; he relies on this evidence solely to rebut the suggestion that he was treated with unnecessary candour, or that he was indebted in any sense to Mr. Cooke's liberality."—*Wheatstone*, p. 103.

The above *admission* "that Mr. Cooke is not answerable" for the ill health of Mr. Wheatstone's solicitor might have been passed over as puerile, but for an inference, suggested to the reader, in the worst possible taste, and contrary to the fact.

that during some part of the year 1845 his solicitor, Mr. Richardson, was in a bad state of health. This was to be regretted, undoubtedly, although Mr. Richardson was at all times well represented in his absence by an experienced partner. Fortunately, however, *he was not absent on this occasion*; but *personally perused and approved* the drafts of the obnoxious assignments, and *personally attested* Mr. Wheatstone's execution of them. These deeds, in furtherance of the desire which we both felt to facilitate and expedite the sale of the patents, were drawn up by the counsel of the purchasers, in the form required for their satisfaction. The obligations respecting improvements, undertaken by Mr. Wheatstone, were exactly similar to those imposed upon myself: indeed, I have a copy of his deed, with the names altered in pencil, in the handwriting of the purchasers' counsel, to make it serve as the rough draft of mine.

By the letter of 2nd August,* printed above, Mr. Wheatstone had proposed to commute his royalty "on *all lines in England and Wales* for the sum of £20,000," and "for a further sum of £10,000 (which he received) to "*give up all his rights in Scotland, Ireland and Belgium, with all his reserved rights under the English patents.*" It is plain, therefore, that he understood himself to be offering for sale, in consideration of large sums of money, *all his interest of every kind*. The object which he had in view, as he more than once said to me, and I dare say to many of his friends, was to

* P. 224.

have done with the telegraph, and to apply his leisure to other scientific inquiries, which he had too long neglected.

Whatever amount of obligation, therefore, Mr. Wheatstone may have contracted by the "necessary deeds of transfer"—prepared by the counsel of the purchasers, and approved and attested by his own solicitor—and exactly corresponding, in effect and in form, with the obligation which I contracted myself—the technical expression of his engagement could not well be more comprehensive in its terms than his own letter on which the transaction was founded.

He now asserts in substance :—

1st. That by the assignment of his interest under the existing patents, he assigned more than he had agreed to assign.

2ndly. That by the same assignment he became "bound to - - - assign - - - all his future improvements - - - until - - - 1859"—and

3rdly. That these "additional rights" were "assigned" and "disabilities submitted to" in consideration of an agreement to give him a lucrative appointment which has not been given to him.

I will answer these assertions in their order.

1. Among the patents sold in 1845 there was one dated in that year, and expiring therefore in 1859. It had been arranged by the deed of 1843 that the royalty should continue at all events till 1856, and might continue till 1859 or even longer. If the royalty expired before 1859, Mr. Wheatstone would have acquired under the deed of 1843 (supposing the subsequent deeds of

1845 not to have been signed) not “a joint property” in the residue, if any, of the patent of 1845 remaining unexpired after the expiration of the royalty; but a right “to demand and receive at his - - - own expense - - - a licence to use the invention comprehended within the - - - unexpired patent (of 1845) - - - until the expiration thereof without - - payment - - -” He has “conned over” the deeds within the last twelve months, and this possibility of a three years’ licence, to begin, at the earliest, *after a lapse of eleven years*, is most certainly one of his latest discoveries.

My answer to this first part of his assertions is a very simple one. As he agreed to sell *all interest whatsoever*, this chance, however valueless, of a three years’ licence, under one minor patent, from 1856 to 1859, though not specifically mentioned, was included in the sale.

2. My answer to the second point is equally simple. Mr. Wheatstone’s agreement to make over his future improvements was, on the occasion of each assignment, co-extensive in point of duration with the patents, for the protection of which it was entered into.

On the occasion of the assignment of 1843, it applied itself to all the patents then existing: the latest of which, being dated in 1842, would expire in 1856.

On the occasion of the assignment of 1845, an additional patent, dated in that year, had been added to the former list.

Therefore the clause about improvements, being copied from the assignment of 1843 into the assignment of 1845, became applicable to a patent three years later in date than any to which in 1843 it could apply.

In this way the duration of Mr. Wheatstone's obligation to give up his improvements, *which, as it already stood in the deed of 1843, would have remained in full force for eleven years after 1845, viz., till 1856*, was, by the mere repetition of the improvement clause, without change of principle, and in almost identical language, in the assignment of 1845, extended from 1856 to 1859.

“It is, therefore, that Mr. Wheatstone may fairly complain that the exercise of any inventive faculties he might possess was effectually prohibited. He was condemned to the alternative of suspending his labours, or of handing over their fruits to others not only without recompense, but at an absolute loss to himself. By the fetters in which he was retained, he was precluded from aiding in the development of the invention with which his name is identified; and for some of the best years of his life he was rigorously reduced, with respect to this important object, to a tedious and comparatively sterile inactivity.”*

Whether the merely *comparative* sterility of these years of “tedious inactivity” is to be considered as relative to the degree of sterility of the Professor's fifteen years of inactivity before the commencement of our acquaintance, † I need not stop to inquire. But his grievance would probably never have been heard of, if he had not accepted the post

* Wheatstone, p. 110.

† Ibid, Appendix, p. 114.

of "Scientific Referee" to a competing Telegraph Company, in 1853;* when, seeking to escape from his former engagements, and looking, apparently, only at the deeds signed in 1845, he forgot that the clause about improvements dated back to 1843. It was a happy, though rather late idea, to assert a connexion between the improvement clause and the scientific appointment, and he boldly threatened a lawsuit to set the clause aside, because the appointment had been terminated. My first pamphlet disproved this plausible, but utterly unfounded, assertion, by showing that the

* "THE UNITED KINGDOM ELECTRIC TELEGRAPH COMPANY.

* * * * *

"*Scientific Referee*;

"PROFESSOR WHEATSTONE.

* * * * *

"In the scientific department they will have the cooperation and advice of Professor Wheatstone, to whose inventions and researches the present telegraphic systems, both in this country and on the continent, are in a great degree indebted for their present state of development and efficiency, and under whose counsel they hope to adopt those further improvements and extensions, which the present state of scientific knowledge, and our social relations, demand.

"Commencing with these advantages, the present Company will enter the field of competition free from the heavy incumbrances which have impeded their predecessors. The costly experiments, and the failures, which in many cases have been made by different Governments and Companies, will enable this Company, while avoiding the errors that have been committed, to save a great amount of expense unprofitably incurred. The heavy outlay for patents and expenses, admitted by one Company to amount to nearly £200,000, (*including* £30,000 *paid to Mr. Wheatstone*) will also be avoided."

* * * * *

Times, April 30th, 1853.

obligation, which he professed to have first contracted in 1845, had been contracted, in very nearly the same words, two years before. It has become necessary, therefore, to shift his ground. It is no longer his improvements generally, but some possible residue of them after 1856, which the deeds of 1845, *looking forward eleven years*, constrained him to give up for an *immediate* and "assured income" (query, for life) of £700 a year!

3. From what has been stated, it is evident that the memorandum of 1845, respecting the scientific appointment, was not founded on a new consideration. If, then, Mr. Wheatstone had required it as the condition of his completion of the deeds of assignment, he would have been refusing to perform his agreement, after I had committed myself to others on the faith of it, unless I would submit to concede to him a new set of "separate privileges."

But I need not place Mr. Wheatstone in this invidious position: nor need I depart from the following statement of my first pamphlet:—

"So far from prohibiting the exercise of Mr. Wheatstone's inventive talents, the promoters of the Electric Telegraph Company especially requested me to engage him as the Company's scientific adviser and assistant, on very liberal terms; and a memorandum to that effect was signed, and for a time acted on."* It was as follows:—

* Cooke's Pamphlet, p. 46.

1 Copthall Buildings, London,
3rd October, 1845.

“It is understood that Mr. Wheatstone will take the Chair of a Committee of three, to take charge of the manufacture of the patent telegraphic instruments, and the taking out and specifying future patents, and matters of the like nature, at a salary of £700 a year, and shall devote to such objects what time he shall think necessary. It is also understood that a patent shall be applied for immediately in order to secure Mr. Wheatstone’s improvements in the mode of transmitting electricity across the water; that Mr. Wheatstone shall superintend the trial of his plans between Gosport and Portsmouth; and if these experiments prove successful, then in the practical application of the improvements to the purpose of establishing a telegraph between England and France; the terms on which such Telegraph is to be held being a matter for arrangement between the proprietors of the English and French Patents. These terms are understood as a part of Mr. Cooke’s plans for disposing of the patents for the Electric Telegraph to a Company.

WILLM. F. COOKE.

C. WHEATSTONE.”

After printing this memorandum, Mr. Wheatstone proceeds:—

“This memorandum then was the further consideration from Mr. Cooke for the further assignments of Mr. Wheatstone, and as such it was *tacitly regarded by the latter.*”*

I have placed before the reader sufficient proof that “this memorandum” was not the further con-

* Wheatstone, p. 106.

sideration" for any "further assignments." I have now to add that the last paragraph of the memorandum itself declares the very reverse. Mr. Wheatstone prints it in italics, as if to call attention to the contradiction it gives to his assertions. "*These terms are understood as a part of Mr. Cooke's plans for disposing of the patents to a company.*" *These terms—what terms?*

Mr. Wheatstone's duties, viz. :—

1st. Taking charge of the manufacture of the patent telegraphic instruments.

2ndly. Taking out and specifying future patents, &c.

3rdly. *Applying for a patent immediately "to secure his improvements in the mode of transmitting electricity across the water."*

4thly. Superintending the trial of his plans between Gosport and Portsmouth.

5thly. *If successful, "establishing a telegraph between England and France."*

The equivalent for these services, and for this patent (of great value if realized) being the liberal, but not excessive, salary of £700 a year.

At page 90, when introducing this subject, Mr. Wheatstone says :—

"He was induced by engagements, which Mr. Cooke
 "has never performed, to surrender certain valuable rights
 "beyond the terms originally agreed upon, and to submit
 "to be unjustly fettered in his liberty of invention." - - -

And at page 107 :—

“ Mr. Cooke’s assertions are in substance, as well as in
 “ the letter, a misrepresentation of all that occurred ; and
 “ if a bold, at the same time a most vain, attempt to shift
 “ the responsibility for the breach of the engagement. It
 “ appeared that when the Company had formed the new
 “ connexions to which Mr. Cooke alludes, there was no
 “ longer any disposition to confirm his undertaking.”

And at page 108 :—

“ Nor - - - could he obtain either from Mr. Cooke or from
 “ his solicitor any explanation with respect to the fulfilment
 “ of the agreement, or of the way in which it was to be
 “ interpreted.”

And at page 110 :—

“ It was obvious that there was no intention - - - to fulfil
 “ Mr. Cooke’s engagement. - - - It may be that Mr.
 “ Wheatstone has still a legal remedy for the pecuniary
 “ loss which in consequence he sustained.”*

And again at page 90 :—

“ He was not treated with the ordinary fairness which is
 “ taken to imply open and candid dealing.”

Mr. Wheatstone proceeds to supply me himself with an answer to these gently-worded charges. He follows up the memorandum by stating :—

“ In a letter dated December 13th, 1845, Mr. Cooke says,
 “ ‘ I hope we shall get into our new offices and workshops
 “ before Christmas. We will then carry out our own manu-
 “ factory, and call you to our councils.’ Again, on January
 “ 14th, 1846, he writes, ‘ Will you meet me here at four
 “ o’clock to-morrow? I wish to introduce you to Mr.

* This is a repetition of the empty threat of legal proceedings which Mr. Wheatstone brought forward in 1853, but of which nothing has been heard since.

“Ricardo, who will be here at that time, that we may
 “arrange about your position with us as scientific adviser.
 “Mr. Ricardo has from the first been acquainted with, and
 “approved of, my agreement with you.’ ”*

The introduction took place accordingly; and Mr. Wheatstone describes the result of it as follows:—

“It is true enough that, as Mr. Cooke avers, ‘the
 “memorandum was for a time acted on: for it was acted on
 “by Mr. Wheatstone on the assumption that it would be
 “confirmed.’ - - - Mr. Wheatstone gave in fact consi-
 “derable time and attention to the objects therein con-
 “templated; and afforded all the assistance that was
 “required of him by the Company in the preparation of
 “telegraphic instruments, and in their parliamentary and
 “legal proceedings. He also made, in accordance with the
 “second paragraph of the said memorandum, an extensive
 “series of experiments on methods of insulating con-
 “ducting wires for the purpose of crossing the sea; and
 “he was preparing the specification of a new patent for
 “the improvements effected. - - - Mr. Wheatstone was
 “preparing his various plans for the manufacture of the
 “Submarine Telegraphic Line. - - - Mr. Wheatstone
 “was about to leave town to superintend some experiments
 “at Portsmouth - - - The sums expended for labour and
 “materials were repaid.”†

Thus far Mr. Wheatstone supplies me with evidence from himself that I introduced him to his post; that he acted upon the introduction with no slight degree of independence and authority; and that his expenses were repaid. He adds the following evidence, to a similar effect, from Mr. Ricardo, as Chairman of the Company.‡

* Wheatstone, p. 106.

† Ibid, pp. 108—110.

‡ Wheatstone, App. p. 126.

London, February 13, 1855.

“DEAR SIR,

I have looked back to such papers as I could find in the Office of the Electric Telegraph Company, in order to enable me to answer the questions put to me in your letter of the 8th of this month.

So far as I can recollect, it was stipulated by the Company with Mr. Cooke that they should have the advantages of your services at a salary of £700 a year, should they require them, but it was no part of the agreement that they should be bound to accept them whether they required them or not. The point, however, was not raised, for the Company found themselves involved in a difficulty before the Committee of the House of Lords on their bill, arising from a dispute between Mr. Bain and yourself.

In order to obtain their act of incorporation, they found themselves compelled to come to a compromise with Mr. Bain, by which he became identified with the Company, and was subsequently elected a Director.

On this arrangement being made, you declined further connexion with the Company, and therefore the question of your appointment never came before the Board, and I have looked over the Minutes without finding any allusion to it.

In the meantime you had conducted some experiments at the Strand and at Portsmouth, and I have before me a receipt dated 22nd February, 1847, for expenses incurred, in which you allude to a bill delivered which I think was never sent to the Company, as the only bill I can find is one for the manufacture of certain instruments receipted and dated 23rd July, 1846.

I am, dear Sir,

Faithfully yours,

J. LEWIS RICARDO.”

PROFESSOR WHEATSTONE.

In a note appended to Mr. Ricardo's letter, Mr. Wheatstone makes the following statement:—

“The connexion of the Company with Mr. Bain was not of long duration, and when this impediment was removed, Mr. Cooke took no steps to fulfil his engagement, though urged to do so by Mr. Wheatstone.”*

I consider that I had fully performed my duty, both to Mr. Wheatstone and to the Company, by my introduction of him to Mr. Ricardo and the Directors, on the 15th January, 1846, followed by his provisional connexion with the Company; and I do not believe there is the slightest foundation for his assertion, that on any occasion whatever previous to his threat of legal proceedings, to justify his accepting office under a competing company, in 1853, he made any kind of application to the Directors, or to my solicitor, or to myself, to fulfil any supposed engagement, or to take any further step in the matter. Had the fact been otherwise, there must have been some record of it, or at least it would have been known to somebody connected with the Company. I will only add that the very note extracted above admits by implication that Mr. Bain's connexion with the Company was, while it lasted, an “impediment” to the proposed connexion of Mr. Wheatstone with the Company; and that it is the impression of all those who were connected with the undertaking in its earlier stages, that the cause of Mr. Wheatstone's retirement is

* Wheatstone, p. 127.

correctly stated in my first pamphlet, and in Mr. Ricardo's letter.*

He complains that his appointment was "not confirmed." It could not be officially confirmed by a Board minute till the Company was incorporated, for until then there was neither Board nor Minute-Book; and it was before the passing of the Act of Incorporation that the involuntary cause of offence

* "See for a direct contradiction the letters of Mr. Ricardo and Mr. Wheatstone, Appendix B, the statements of the former gentleman being at complete variance with the positive assertions of Mr. Cooke."—*Wheatstone*, p. 107.

To enable the reader to compare the two, I repeat my former statement, to which I adhere.

"But so far from prohibiting the exercise of Mr. Wheatstone's inventive talents, the promoters of the Electric Telegraph Company especially requested me to engage him as the Company's scientific adviser and assistant on very liberal terms; and a memorandum to that effect was signed, and for a time acted on.

"Mr. Wheatstone, however, soon resigned his appointment,† under the following circumstances.

"A Bill for the incorporation of the Company, which was brought into Parliament in the session of 1846, was opposed by Mr. Alexander Bain, who asserted in his petition that he had invented an electric clock, and an electric printing telegraph, and had communicated his inventions confidentially to Mr. Wheatstone, and that the latter had claimed them as his own. The Directors carried their Bill, notwithstanding this opposition, though not without difficulty, through the House of Commons; but Mr. Bain's statement and evidence made such an impression in the House of Lords, that, in the afternoon of the third day of the sitting of the Lord's Committee, the Duke of Beaufort, as Chairman, intimated to the Company's counsel that the Committee were of opinion that the Company ought to make an arrangement with Mr. Bain—hinting, in fact, pretty plainly, that their Bill might be thrown out if they declined to do so. After a

† Or according to Mr. Ricardo, "*declined further connexion with the Company.*"

occurred, which gradually led to a termination of the connexion. He complains also that he "never received any salary or remuneration in respect of personal services." He did not ask for any; and it would have been in bad taste to make a claim for a few months' services, rendered at much expense and without benefit to the Company, by a patentee abstracting from the concern £30,000 in cash. He says that I informed him "a short time after" the compulsory compromise with Mr. Bain, "that the Directors objected to his appointment because of the expense." This I simply deny. Mr. Ricardo's letter, and other evidence, which shall be forthcoming if necessary, show that the objection to the continuance of the appointment came from himself, and in the way described. But if the fact were otherwise, it would not justify him in having calumniated me behind my back, as if I had treated him dishonourably. If he had brought forward his "legal claims," or any claims of any kind, no doubt they would have received due consideration: and the Directors might be excused, even if they had cooled a little in their estimation of his services, after several months' experience of them had shown that the under-water "improvements"—on the face of the memorandum of the 3rd October the main object of his engagement—would come to nothing.

consultation with counsel, it was considered necessary to give way. Mr. Bain was accordingly bought off, and became associated with the Company to the extreme displeasure of Mr. Wheatstone."—*Cooke's Pamphlet*, pp. 46, 47.

But, from October 1845 to June 1846, Mr. Wheatstone was on the best possible terms with the Company. He had full command of the Instrument Department. He had full scope for "his operations" at Portsmouth: in fact, he was the whole "Committee."

Thus the memorandum was "for a time acted upon" by the Company and myself—but how was it acted upon by Mr. Wheatstone? He took no steps towards fulfilling the essential condition that a patent should be applied for immediately to secure his "improvements in the mode of transmitting electricity across the water." Except in his department, all was energy and activity. Mr. Ricardo was engaged in contriving the central station, organising the telegraphic system, and conducting our bill through Parliament. My attention was required far and wide over the country, in superintending a great extent of new works and arranging agreements with railway boards. Our engineer was making every effort to complete the Admiralty line between the termini of the railway and the Admiralty Offices at Portsmouth and Whitehall; for in the meantime the payment of the rental was suspended. Nothing was wanting but the "improvements in the mode of transmitting electricity across the water" at Portsmouth, to be used also for transmitting it under the streets in London. This want Professor Wheatstone was to have supplied. It was especially, indeed exclusively, in his department; and he had the "resources of a powerful establishment at his command." What was the

Professor about? He says he was making "an extensive series of experiments on methods of insulating conducting wires for the purpose of crossing the sea."* But how does this agree with the memorandum that the "patent (of course for something already invented on the 3rd October) was to be applied for *immediately*." How does it agree with what follows?

As early as 1840, he tells us, in his "Note on the Submarine Telegraph,"†

"Having been furnished with the necessary hydrographic information, - - - he prepared his detailed plans, which were exhibited and explained to a great number of visitors at King's College, among whom were the most eminent scientific men and public authorities.

"He also made the subject known in Brussels. In a notice of his new telegraphic instruments, by Prof. Quetelet, published in the 'Bulletin of the Academie Royale de Bruxelles' for October 7th, 1840, it is stated,—“On sera sans doute charmé d'apprendre que l'auteur a trouvé le moyen de transmettre les signaux entre l'Angleterre et la Belgique, malgré l'obstacle de la mer. Son voyage se rattachait en partie à cette importante opération, qui mettrait l'Angleterre en rapport immédiat avec notre pays, la France, la Hollande, l'Allemagne, et même la Russie.”

"And in 'Le Fanal,' a Brussels paper of September 30th, 1840, it is observed,—‘M. Wheatstone pense qu'il est possible de communiquer avec son appareil entre Douvres et Calais; il répète en ce moment ses expériences à l'Observatoire de Bruxelles, en presence de plusieurs savans litterateurs.’

"Mr. Wheatstone's plans were also shown in 1841 to

* Wheatstone, p. 108.

† Ibid, Appendix, p. 130.

some of the most distinguished scientific men in Paris who came to see his experiments at the College de France.”

“The Abbé Moigno was in England in the spring of 1846, whilst Mr. Wheatstone’s experiments were in preparation, and he published an account of what he had seen in ‘L’Epoque’ of October in that year.” This notice he afterwards reproduced in the first edition of his *Traité de Télégraphie Électrique* (Paris, 1849). It is as follows:—

“M. Quételet avait annoncé, dès 1840, que M. Wheatstone avait trouvé le moyen de transmettre les signaux entre l’Angleterre et la France, malgré l’obstacle de la mer. J’ai vu de mes yeux, j’ai touché de mes mains le conducteur qui, en se reposant au fond des mers, unira étroitement les côtes d’Angleterre aux côtes de France. Ce conducteur est parfait, il remplira pleinement son but; tout homme sérieux qui l’aura vu et touché comme moi ne pourra pas même conserver l’ombre d’un doute sur un succès devenu palpable. Avant deux mois, des machines puissantes l’auraient produit dans toute sa longueur, mais partagé en section de deux kilomètres et demi. Huit jours suffiraient aux officiers de marine, qui s’y sont préparé par une étude approfondie, pour le mettre en place, et après quelques semaines Paris et Londres se toucheraient; il n’y aurait plus ni abîme, ni distance, le génie de l’homme aurait tout vaincu.”

If Mr. Wheatstone had really done all this, why was not a patent “applied for immediately,” or at least between October 3rd 1845 and June 1846, or down to the time when his experiments were given up the following autumn? And why did he waste time in preparing the specification, to be lodged six months after the date of the patent, instead of first taking measures to obtain the patent itself?

If the various doings and expectations “collected

together and published" in his Appendix represented real things, I should have to complain of a breach of Mr. Wheatstone's engagements, under the deeds of 1837 and 1843, to make "a full and open disclosure" to me of all his improvements, and to "keep the same secret from all other persons." But I acquit him of any breach of agreement, for it is sufficiently evident that he had not any invention to patent or to disclose. The fanfaronades in the Brussels' papers, in the Paris report, and finally in Moigno's work, — like his first "announcement in public print" in the 'Magazine of Popular Science' for 1837, were only *scientific landmarks* — "*publications ayant date certaine*"* — for Mr. Wheatstone to point back to when the Submarine Telegraph should have been realised by some practical inventor.

In the meantime, the failure at Portsmouth left his submarine conception (with his Telephone †) "in abeyance"; ‡ till "five years afterwards it was taken up from Mr. Wheatstone's starting point," — the wrong side of the harbour at Gosport. Sir John Guest's question, — paraded in his Appendix, — "Have you *tried* to pass the line through water?" §

* Arago on Claims to Discoveries, *Supra*, p. 194, note.

† "I thought that I had the most efficient and economical means of establishing a - - - telephonic communication between two remote points, that could be thought of. - - - My ideas respecting establishing a communication of this kind between London and Edinburgh you will find in the 'Journal of the Royal Institution' for 1828." — *Wheatstone, Appendix*, p. 114.

‡ *Wheatstone*, p. 132.

§ *Ibid*, p. 130.

might be answered by himself in the affirmative; but the next question, from Lord Seymour, "Could you communicate from Dover to Calais in that way?" had better be answered by those enterprising gentlemen to whom the world is indebted for the accomplishment of so great a work.*

Mr. Wheatstone says,† that my "version of the transaction" with Mr. Mapple "is as usual inaccurate." What I said, was—

"About the same time, the Directors unluckily made an agreement with a Mr. Henry Mapple, in ignorance that this person had a similar controversy with Mr. Wheatstone respecting an improved alarum and a telegraphic rope."‡

I know that Mr. Mapple had a "controversy"

* When on the point of sending my last corrected proof to press, I gave a final glance over the pages of Mr. Wheatstone's Answer, to see that no point deserving of notice had been overlooked. Observing that Mr. Wheatstone quoted from the first instead of the second edition of Moigno's work, and suspecting some sufficient cause, I turned to the Abbé's second edition, and to my amusement, if not to my surprise, I found that the grandiloquent clauses extracted by Mr. Wheatstone in his "Note on the Submarine Telegraph" had given place to the following passages (p. 259).

"M. Matteucci indique comment il comprend qu'on pourrait établir une communication télégraphique entre Calais et Douvres. M. Wheatstone avait eu avant lui cette idée.".....

And again at page 582.—"Comme nous l'avons vu, la pensée de cette entreprise grandiose appartient à M. Wheatstone, qui dès 1847 avait tout préparé pour la réaliser."

The Professor has established his *scientific landmark* in the first edition, and the Abbé's attempt to dislodge it is vain—"le génie de l'homme (M. Wheatstone) aurait tout vaincu."

† Wheatstone, p. 109.

‡ Cooke's Pamphlet, p. 47.

with Mr. Wheatstone similar to that of Mr. Bain. But, if not, what is it that Mr. Wheatstone complains of? He does not say that Mr. Mapple pilfered any invention of his, but only that he took out a patent for "some supposed improvements *which he had made* while executing Mr. Wheatstone's orders."* Mapple, when working on the Company's behalf, and at the Company's expense, invented something for which the Company thought fit to take out a patent—a patent which was to supply the want of that invention, which Mr. Wheatstone had promised to patent a year before, and for want of which the business was stopping. Moreover this transaction did not take place until some months after the proceeding in the House of Lords had rendered the termination of Mr. Wheatstone's connexion with the Company evidently a mere question of time.

Professor Wheatstone concludes his Answer with a censure of the "narrow policy" of the Electric Telegraph Company, and a parting hit at myself. "No one," he says, "has been, or could be, benefited by the narrow policy which persists in retaining valuable instruments in their present stage of incompleteness, and arrests as far as possible the progress of invention." "No one in connexion with the Company has shown the slightest interest in developing his various improvements." - - - "With the resources of a powerful establishment at his

* Wheatstone, p. 110.

command, with every inducement to proceed, and with no restrictions to deter him," Mr. Cooke, since Mr. Wheatstone's retirement, "has not, that Mr. Wheatstone is aware of, contributed a single addition to scientific knowledge, or to the apparatus and practical application of the Electric Telegraph." *

Mr. Wheatstone may, indeed, assert with truth, that the Company, possessing two systems of telegraph widely established, and answering every practical purpose, viz., Mr. Bain's chemical recording telegraph, and my two-needle telegraph, have not been inclined to interrupt their business and waste their money by attempting to withdraw Mr. Wheatstone's instruments from that "stage of incompleteness" in which he left them after six years of fruitless experiments. This want of "interest in developing his various improvements" did not, however, always exist. For two years, at my own expense, as I can prove by very many of his letters, I placed my wires both on the Great Western Railway, and on the entire length of the Portsmouth line, at Mr. Wheatstone's disposal, for experiments with his mechanical instruments; but even under his own immediate charge, they never could attain any certainty in working. The celebrated game of telegraphic chess between London and Portsmouth was to be played by Mr. Staunton through the mechanical telegraph, but it broke down at starting, and the "Illustrated London News" † gives a sketch of the Two-needle Telegraph doing the work in-

* Wheatstone, p. 111.

† No. 154, April 12, 1845.

stead. Mr. Wheatstone's mechanical telegraph was to be employed on the Blackwall line, and I paid him in advance for the instruments, but never got them.* I heard, indeed, of their being under experiment at Paddington; but from thence they returned to Mr. Wheatstone's workshop, and were seen no more. The Company also for a time employed Mr. Wheatstone's mechanical instruments for the Admiralty work between London and Portsmouth, till they were ordered to be replaced by the more trustworthy two-needle telegraph. These are a few instances out of many failures. The Mechanical Telegraph, though highly promising in theory, has the inherent defect of superadding to the difficulty of transmitting the electric current† the risk of failure in the machinery.

Even if Professor Wheatstone had been successful in his own limited experience, it would be somewhat presumptuous in him to pass a sweeping condemnation upon the conduct of a great Company. The Direction and Staff of the Electric Telegraph Company have comprised some of the most able and successful practical men of the day. Are such men to be lightly charged with "narrow policy," when they have followed up for ten years a great practical

* Arbitration Papers, § 699

† The Mechanical Telegraph labours under a further disadvantage. To produce any effect upon machinery, the electric current must have sufficient force to remove the detent or escapement. Short of that there is no result. Whereas a very feeble current, far short of the power requisite for good working, produces a movement of the magnetic needle quite sufficient for sure though slow signalling.

object, with constantly improving practical means, to a successful practical result?

Whilst, from the commencement of their career, the Company have been pursuing one steady, sensible and business-like course, their officers have been instructed to try every new instrument and scheme of promise which has been brought to the notice of the Directors. A munificent, but discriminating liberality has distinguished the conduct of the Company in this respect; and many valuable improvements, so obtained, have been, and at the moment I write are still being, engrafted on their two systems of telegraph. If it has sometimes proved sound policy to secure patents of minor value, either to encourage the inventors, or to avoid litigation, in no single instance has anything been bought up for the purpose of suppressing it.

A widely-extended undertaking, once established, could not, indeed, be suddenly or easily changed, even if a change were shown to be in itself desirable. The clerks, highly skilled in working the present instruments, would have to learn their work afresh. The new apparatus must undergo the slow process of expensive adaptation and progress towards ultimate perfection. Capital invested in apparatus must be thrown away; an important consideration, though a minor one, if increased economy, rapidity and correctness, would result from a change of system. But if the Company were to change their present systems, is there the slightest reason for supposing that Professor Wheatstone's instru-

ments would be introduced in place of them? In America, a great many telegraph companies exist in active rivalry, and several different systems work side by side on the same lines of railway. There a splendid opening presented itself for Professor Wheatstone's instruments, unguarded by patent rights, and known long since by the publication of the English specifications. That they are *nowhere in use* among the Americans affords the most convincing proof that they are not considered by that most practical people, any more than by ourselves, to be of a practical character. On the other hand, I do not speak from my own twenty years' experience alone when I say, that the Electric Telegraph Company employ three* of the best, if not the two very best, of all the known systems of electric telegraph.†

One word as to my non-contributions to the telegraphic apparatus since the Professor deserted us. For a time after the formation of the Company, I was almost exclusively engaged in pushing their out-door works; but, when Professor Wheatstone "declined further connexion" with us, the instrument department was placed under my supervision. It then became my duty to examine and advise upon a great variety of inventions constantly submitted to my inspection. The incentive to re-enter the field of invention was great, and the faculty can hardly be denied to me; but, in the position which the

* Professor Morse's simple and certain Recording Telegraph is used by the Telegraph Company in communicating with the Continent of Europe.

† *Supra*, p. 186; Moigno, pp. 157, 391, and 541.

Board wished me to hold, any rivalry with the inventors who brought their schemes for my examination would have clashed with the duties which I undertook to perform. I resolved, therefore, to aid and encourage others, but never more to compete with them.

During the last ten years, very many inventors have fearlessly confided their secrets to me; and I am happy to say that it has been in my power to assist several meritorious men, by recommending their discoveries to the patronage of the Electric Telegraph Company.

I have now followed Mr. Wheatstone, step by step, through his seventy-four compact pages. Having refuted each part of his Answer separately, I will conclude my Reply on the 27th February,—the nineteenth anniversary of my “introductory visit” to him,—by bringing together, in one view, a summary of our respective contributions to the telegraphic enterprize, and of our consequent claims to consideration in the distribution of the fruits of its eventual success.

Professor Wheatstone relates how “from 1823 to 1837 he devoted himself to scientific researches into the laws of sound and electricity, as the means of communicating intelligence, with the ultimate intention of publishing his results, and allowing any person to carry them into practical effect.”* When

* “It is evident that Professor Wheatstone had turned his mind to the Telephone and to the Electric Telegraph for fourteen or fifteen years, without any practical result. This is a fact admitted in his Case, but it is still more distinctly stated in his letter of the

I had brought my practical plans and instruments to his notice, he suddenly adopted more practical views himself. He became my active and jealous rival in the invention. He invented the five-needle hatchment instrument, which for the reasons he assigns did not answer "in a commercial point of view."† In 1840, he brought out his mechanical instruments. But between that year and the end of 1846, he failed in turning them to account for his own profit as domestic appliances, and equally so in conjunction with myself, and afterwards with the Telegraph Company, for commercial use. In 1843, he made over the patents to me, and was relieved from all further risks and responsibilities. Later in the same year, he aided me in obtaining an order from the Admiralty for the Portsmouth Telegraph; but after due deliberation declined to join me in the speculation. In 1845, he sold his royalties to the Telegraph Company. He took £30,000 out of the infant concern. He refused to embark a shilling in it,

26th October last (1840), which contains the following passage:—
 'When you (Mr. Cooke) first proposed a partnership, you know how strongly I opposed it, and on what grounds I did so. I said that I felt myself perfectly confident of being able to carry out my views to the ends I anticipated, that I fully intended to do so, to publish the results, and then to allow any person to carry them into practical effect.' So that on his own showing, he not only had not, when Mr. Cooke consulted him, carried his researches into practical effect, but it was not even his intention to do so; nay more, he was not yet even preparing for his intended publications."
 —*Arbitration Papers*, § 513.

† Wheatstone, p. 58, note, and *Supra*, p. 186, note.

or to accept a seat at the Board,* but was willing to accept a large salary without risk. He undertook to apply for a patent immediately for his invention of a submarine telegraph, made five or six years before, in 1840. But after twelve months' further experiments, the matter remained in "abeyance," and no patent was applied for. In 1853, he joined a rival company as "Scientific Referee," to compete with the Company who had paid him £30,000 for his share in the inventions.

For my part, I commenced my telegraphic labours fourteen or fifteen years after Professor Wheatstone, but the Award declares me to have been the originator of the practical telegraphic undertaking. I went to him with practical "plans and instruments" before he had any telegraph at all.

"Within two and a half months after Mr. Cooke consulted him, a patent was applied for; and within four months after the sealing of the patent, the Chairman and London Directors of the London and Birmingham Railway Company were decidedly in favour of laying down the Electric Telegraph from London to Birmingham, in consequence of a course of experiments, which letters will prove to have been undertaken and satisfactorily concluded within those four months by Mr. Cooke, upon their line and at their expense."†

My two-needle telegraph, my one-needle telegraph, and my alarum were gradually adopted throughout the country. In 1842, my patent for suspending the wires in the air struck off two-

* Wheatstone, p. 108.

† Arbitration Papers, § 515.

thirds from the cost of the telegraph.* In 1843, I acceded to Professor Wheatstone's wish† that I should relieve him from past and future liabilities, and secured to him a fixed and liberal royalty on all future business. In conjunction with the South Western Railway Company, I embarked a large capital in the London Portsmouth and Southampton Telegraph, the earliest Government and Commercial Electric Telegraph in the world; on which, out of my private means, I paid Professor Wheatstone some £1500 royalty. The success of this line, extending in one length of wire about 100 miles, established the reputation of the Electric Telegraph throughout Europe and America.

In 1845, I sold my interest in the patents, and a very large engineering business, to the Electric Telegraph Company for £96,066, and re-embarked in the shares of the Company £45,500, involving liabilities to the extent of £136,500 more. I further proved my confidence in the enterprise by relieving the funds of the Company, heavily drained by the abstraction of £30,000 in cash to pay my former partner, by agreeing to wait for a gradual payment of a balance due to me, out of the profits when realised.

Since 1845 I have remained a Director of the Company, and in the coming month of March I

* In the system of suspension, iron wire, or iron rope, was substituted for copper wire. Finding paint or tar an expensive and ineffectual mode of protecting the iron wire from rust, I determined to try the then new process of "galvanizing." The Galvanized Iron Company undertook the experiment, and I became one of their Directors to superintend the operation. † *Supra*, p. 218.

shall have toiled in the cause of the Electric Telegraph for twenty years.

Mr. Wheatstone's Answer might supply materials for another striking contrast. It was written under the pressure of two conflicting necessities. His "cordial" and "grateful" acceptance of the Award had precluded an open repudiation of it. On the other hand, it was requisite to justify a long course of public and private statements entirely at variance with the facts which the Award records. Hence the principle of "duality" which characterised Mr. Wheatstone's instrument has reappeared in his Answer. Has he been constrained, by the plain words of the Award, to yield to me a tardy and reluctant acknowledgement of my title "to stand alone" as the person "to whom this country is indebted for having practically introduced and carried out the Electric Telegraph as a *useful* undertaking?" His second line of defence has led him, on the contrary, to describe the invention which I so introduced as "inefficient," and "inapplicable," and "abortive," and "*useless*."* "Mr. Cooke was no longer contented with sharing the *pecuniary profits of Mr. Wheatstone's inventions*, but he wished to participate in Mr. Wheatstone's independent reputation."† In one page it is in effect admitted, that "Mr. Wheatstone supplied‡ to M. Quetelet materials" for misrepresentations, the most flagrant of all those which preceded the arbitration

* Supra, p. 147.

† Wheatstone, p. 72.

‡ Ibid, p. 86.

—misrepresentations, excluding me even from portions of the invention, such as the Alarum and Detector, in which Mr. Wheatstone had no part, and rendering “nugatory and useless my separate rights in several continental countries which Mr. Wheatstone had agreed, by our partnership deed, to leave open to me;”*—misrepresentations, too, of which Mr. Wheatstone once professed to know nothing; they might be right or they might be wrong; but he had given them no sanction.† But against this admission that he had personally supplied materials for excluding me from the invention altogether, we have a page of extracts to prove that his evidence before the Select Committee on Railways, respecting my practical labours on the Great Western line, when “corrected by him with the express view of removing any ground of objection on my part,”‡ mentioned my name, in a secondary position,§ four times in as many folio

* “One of my objections to the publication of the Brussels experiments was, that by circulating over the continent an idea that the Electric Telegraph was Professor Wheatstone’s sole invention, it tended to deprive a supposed adverse claimant of the support of the government of any country in which such an opinion was prevalent, and consequently to render nugatory and useless my separate rights in several continental countries, which Mr. Wheatstone had agreed, by our partnership deed, to leave open to me. Another circumstance, of a similar character, connected with Russia, has lately transpired, and has been mentioned to him in a recent letter.”—*Arbitration Papers*, § 224.

† Wheatstone, Appendix, p. 113. ‡ *Arbitration Papers*, § 199.

§ “I have here a drawing of the specification to the first patent taken out by *myself and Mr. Cooke*.”—*Wheatstone*, p. 85, (referring to *Cooke and Wheatstone’s Patent of 1837*.)

pages. The patent of 1840 is judiciously thrown in to distract attention from the questions really at issue. But the Professor's inconsistency is too glaring to be disguised by illogical reasoning or rhetorical artifice. The Award cannot be both true and false. If it is true, why has he not acted in accordance with it? If it is false, why did he put his name to a "cordial" and "grateful" acknowledgement of "the correctness of the facts stated" in it? There is no escape from this dilemma; and though it is now, as I long since warned him it one day would be, "beyond his power to do me justice without dishonour to himself,"* a frank confession of his error will attach to his well-known name a fainter and less enduring stigma, than any renewed attempt to justify an inconsistent and disingenuous course of conduct.

An "originative share in the first telegraphic patent"† no one can deny to him; for he introduced into it the dry battery contacts, and the important and valuable improvement of the vertical needle. My letters, from which he makes some incomplete quotations,‡ and the conversation referred to in a former page, and many other letters

* *Supra*, p. 211, note. Arbitration Papers, § 213.

† Wheatstone. p. 50.

‡ "It is inconsistent with his (Mr. Cooke's) written admissions, so late as January 7th, 1845; for, in his letter to Mr. Wheatstone of that date, he observes:—'You reap your most popular reputation from this invention:' (referring to the Electric Telegraph)—'for the part you have performed in it, you deserve it! but it is my belief that I deserve as much for what I have done, not as a scientific, but as a practical man.' In a letter of the 20th of October, 1840, he had urged Mr. Wheatstone to put him in a right position with

and conversations which might be mentioned, limited my claim to "a perfect equality, which was all I asked; urging, that his scientific discoveries were an ample balance to my projection."* Nor should I have felt inclined, if he had honestly put me forward as his co-inventor, to weigh very accurately the "relative shares of merit" allotted to us in the public estimation; or to quarrel with a partner of European reputation, if others had forced upon him without his seeking it, the credit of having contributed to our joint invention the larger share.

Even at the risk of exposing myself to a fresh outburst of Mr. Wheatstone's ridicule,† I must still venture to maintain that the question between us is not a scientific question. For in what does the merit of the Electric Telegraph really consist? "If the invention were to be described generally in a few words, how would you describe it? Might it not be called an application of a few known principles, by means of a few simple contrivances, to produce a practical result, which the experiments of scientific men, though their attention had been directed to the subject for a long series of years, had failed to produce? The merit of the invention must then consist, in a very great degree at least, in the *practical realization* of that regard to their joint invention—'not indeed as the original projector and leading inventor, for that I did not ask or desire,' *'but as the inventor, equally and jointly with yourself, standing, in point of merit, upon precisely the same ground.'*"

The words printed in italics were overlooked by Mr. Wheatstone when selecting his quotation.—See *Wheatstone*, p. 51, note.

* *Supra*, p. 211, note.

† *Wheatstone*, p. 77.

“ which had been before an idea or an experiment.”*
 To the merit, such as it may be, of this “ practical realization,” I have maintained, from first to last, one consistent claim. Eighteen years ago my unanswered letter of 1838† referred to it as understood and admitted. Fifteen years ago the Arbitrators solemnly awarded it to me ; and it is not without cause, nor till after long forbearance, that I now expect a final confirmation of the same unpretending claim from the justice of the Public. “ There is no magic in terms,” as Mr. Wheatstone says ; and it is not worth discussing whether the name of “ originator, projector, or any other title as sonorous and equivocal,”‡ sufficiently expresses my right to a position, unambiguous in itself—which Mr. Ronalds, under the favouring circumstances in which I found myself, might probably have occupied—or a gentleman at Renfrew, whose anonymous suggestion, a century in advance of his time, has recently been made public.§

“ The philosopher’s researches into the laws of nature are essentially distinct from the labours of the practical man who applies those laws to the purposes of daily life. I may therefore consistently yield to Professor Wheatstone a high rank among those scientific men, who - - - in several countries, entertained theoretically the idea of an improved mode of transmitting intelligence.”||

* Arbitration Papers, 500.

† Cooke’s Pamphlet, p. 23. Arbitration Papers, p. 8.

‡ Wheatstone, p. 88.

§ North British Review, vol. 22, p. 548. || Arbitration Papers, § 2.

APPENDIX.

Note on the Mechanical Telegraph, extracted from the Arbitration Papers.

“About the month of June, 1839, while engaged in my practical labours, I accidentally heard through a scientific channel that Professor Wheatstone had invented some new instruments. I called upon him and mentioned the circumstance. He said that he had been about to write to me, but as he appeared to be unprepared at the time to confide his invention to me, I offered to postpone his doing so till another day. On my calling upon him by appointment a second and a third time, further postponements took place. Eventually, some months afterwards (early in November, 1839), he showed me his new instruments: before doing so, however, he made certain proposals to me. The first was, that to enable him to keep some good workmen about him and to proceed with his experiments, he wished me to allow him the privilege of exclusively manufacturing his new instruments, for his own benefit, (the exclusive right of manufacturing all the instruments having been secured to me by the Deed of November 1837). I said that nothing could be more reasonable, and unhesitatingly acceded to his request. Secondly, he wished me to give him the further privilege of introducing his new instruments into private use, for certain domestic and official purposes; alleging that such privilege could in no way interfere with my general interests and operations. This was ultimately agreed to, though I disapproved of a separation of interests. He also asked, upon the express ground of the novelty and originality of his invention, and

of its applicability to other purposes besides telegraphing, that his name might be placed alone upon his instruments; to which I also assented. Some new continental arrangements were also proposed by him, and agreed to by me: he also asked and obtained 'the right of establishing telegraphic lines between England and the Continent.' * * *

"These proposals Professor Wheatstone calls 'conditions;' and he has stated in his letter that he 'required' them as a compensation for his valuable improvements. They certainly bore the appearance of conditions, for they were asked and in part conceded, as he himself states, before his improvements were confided to me; but surely he is wrong in regarding them as conditions which he could have 'required,' or which under the circumstances he was even justified in asking, for each party is bound by our partnership deed to throw into the common stock every improvement or invention connected with telegraphing by electricity, even though it should supersede the whole original invention, and to disclose it to the other without reserve or delay; a provision which gave Professor Wheatstone an equal share in the second patent, and has held a prominent place even in our arrangements with third parties. * * *

"It will be important that the Arbitrators should keep in view the real nature of these separate privileges, when the question of our pending agreement comes before them. They may then have to decide in favour of some of Mr. Wheatstone's claims as matters of right, and enforce them, as he has attempted to enforce them, against my protest; or simply to confirm what I have conceded, and do still willingly concede to him, as a gratuitous and free gift out of my own rightful property solemnly secured to me by our first agreement. But even while confirming to the extreme letter all I ever promised, the use Mr. Wheatstone has lately made of his separate privileges,—his efforts to extend them little by little, and

even to transfer them to third parties, though bound to the contrary,—the interruption they have recently occasioned in an important agreement connected with our general interests, at a critical moment;—all these circumstances combined force me to appeal to the Arbitrators, whether - - - they were creditably obtained, and to protest that they have been used as ungenerously towards myself, as injuriously to the prosperity of the partnership. * * *

“ His separate privileges having been conceded, Professor Wheatstone showed me his new instruments. Much as I admired the elegance of their form, I was astonished to perceive in them,—not the new and original invention I had been led to expect,—but an improved reproduction of my own mechanical arrangements. To this day, however, Professor Wheatstone maintains the entire originality of his invention. He states in a recent letter, that after I had been some time his partner, ‘ he commenced a series of researches on the laws of electro-magnets;’ ‘ that he was fortunate enough to discover the conditions, which had not hitherto been the subject of inquiry, by which effects could be obtained at great distances; that ‘ this rendered electro-magnetic attraction for the first time applicable, in an immediate manner, to telegraphic purposes;’ that ‘ he then proceeded to inquire how the principles he had ascertained could be best practically applied;’ and that ‘ the result was a variety of new instruments and apparatus,’ which, in another part of the same letter, he declares to be ‘ as original combinations as ever were put together.’ I cannot but think that it would have been better and more correct, if he had said that he applied to ‘ instruments and apparatus,’ based upon principles and mechanical arrangements which I had imparted to him, a discovery attained by those ‘ researches on the laws of electro-magnets’ to which I had directed his attention two years before.

“ Some time after Professor Wheatstone had shown me his new instruments, we met on the occasion of taking out

our third patent, when he asked for an allowance for the expense of his experiments. I pointed out to him that his experiments had benefited himself, as his separate privileges had been granted in consideration of the results to which they had led. On his repeating his request, and urging that a similar allowance was made to me at the commencement of our partnership, I took up his account-book, and, without further remark, put down £100 to his credit. This allowance, which certainly could not be a 'condition,' may throw some light upon the real nature of the separate privileges.

“If my forms of the mechanical telegraph had been publicly known, Professor Wheatstone might perhaps have been justified in calling his new instrument an original one, just as the inventor of an improvement in clockwork might without impropriety be called the inventor of a new clock; but the case is not at all analogous, if it be considered that my mechanical instruments were never made public, but confided only to a few individuals, and among them to Professor Wheatstone himself. It appears to me that it would have been better if on his having solved the scientific difficulty which I had submitted to him, he had immediately informed me of his success; and had thus, whilst himself applying his discovery, in his own way, to his own 'combinations,' left it open to me also to perfect my mechanical instruments which had been lying neglected for want of it. It appears by his letter that instead of thus acting frankly towards me 'he resolved to carry out his investigations alone, and to inform me only of the final results when obtained.'

“Much depends upon the correctness of my assertion that the two instruments are really in principle the same. The essence of both is the removal of a detent out of clockwork mechanism by magnetic attraction, and its restoration by mechanical re-action;—in my instruments sometimes by a spring, sometimes by a balance weight; in Professor

Wheatstone's by a spring, as in my first instrument. The very peculiar connexions with the battery are exactly the same,—the alarum is the same,—the modes of exhibiting the signals are the same,—the reciprocal action of the communicator is *not* the same, only because Professor Wheatstone has gone back to the imperfect principle of a moveable cross-piece, to be set at the end of the communication (although long ago rejected from the galvanometer form in consequence of the errors it occasioned in practice), while from the first and throughout my mechanical communicator has been self-acting, restoring itself after each individual signal.

“In making these observations, I am far from wishing to limit Professor Wheatstone's invention to a scientific discovery, however important. On the contrary, he also made a practical improvement of great value, by realizing the escapement principle on which I had only experimented; and by thus superseding the ‘chronometric’ division of the mechanical motion, and therefore the necessity of a degree of similarity in the speed or timing of the different instruments. It is in his improved magnets, and in the practical realization of the escapement principle,—and in those respects only,—that his new instrument differs materially from my old ones. The capstan communicator differs from my musical snuff-box barrel, in making and breaking the circuit at each equal division of the mechanical motion; that is, in the escapement principle; but in other respects, my mechanical communicator still retains its essential identity. In both forms of the mechanical telegraph, there is a circular reciprocal communicator, divided into a number of equal parts: whether the operator's finger be used in the one case to move the communicator through a given number of those divisions up to a constant stop; or to stop it* in the other case, when its

* For “to stop it,” read “to set it so as to stop.”

own constant maintaining power has moved it through the same, or a relative, number of the divisions up to an occasional stop.”—*Cooke's Case*, § 82—104.

“ A few words as to Professor Wheatstone's quotations from letters, to prove that Mr. Cooke did not at first consider Professor Wheatstone's new instruments to be founded on his own old ones. This point will depend on the instruments, which are extant. Moreover, the simple fact of Mr. Cooke's having sent to Liverpool for his old instruments, and forwarded them on arrival to Professor Wheatstone, superseded any necessity for risking the irritating and unfriendly discussions which might have arisen from claims made in the absence of the evidence. As to a circumstance which Professor Wheatstone has several times urged in his case as ‘ a distinct acknowledgment on Mr. Cooke's part ’ that the new instruments ‘ were his exclusive inventions, ’ viz., Mr. Cooke's consent that his name should appear alone upon them, he has omitted to mention that this right of putting his name alone upon his instruments (his object in asking which is now sufficiently evident) was, in fact, one of those ‘ conditions ’ which his letter of the 26th October confesses to have been proposed and assented to before the experiments were described or the instruments shown to Mr. Cooke.* And why was it that about half a year elapsed before Mr. Cooke was allowed a sight of the new instruments, though the partnership deed bound Professor Wheatstone by an ‘ express stipulation, ’ and in the most stringent way, to communicate them immediately? Was it because Professor

* “ When I attained some complete and decisive results, I invited you to the College to see them. Before I described to you my new experiments and showed you my new instruments, I proposed conditions. . . . To these conditions, with others of less importance, you assented; and after I had showed you the instruments, . . . you confirmed . . . this assent.”—*Wheatstone, Appendix*, p. 119.

Wheatstone doubted his liberality? Oh no; for he felt no hesitation in trusting to his liberality for an ample reimbursement of the expences of his experiments. But he well knew that his new instruments so closely resembled Mr. Cooke's old ones, that he could not expect to obtain his 'conditions' at all, unless he could extort them in the dark. And it affords no inference against Mr. Cooke, that the letters quoted prove him to have afterwards conscientiously adhered to the promise to which he had incautiously committed himself in ignorance of the real nature of Professor Wheatstone's improvements. The letter of the 11th of December 1839, mentioned by Mr. Wheatstone is a very important one; for it was written by Mr. Cooke at Professor Wheatstone's house, and altered to meet the latter's wishes; yet it only in a general way admits two points, and those two scientific points, to belong to Professor Wheatstone, viz., the improved magnet and the constant circuit. - - - In Mr. Cooke's letter, he did not bind Professor Wheatstone to the exact words used in that letter; on the contrary, he asked 'an explanation which might be to a given effect,' not which was demanded to be given in words; in short, he only required in his letter what he has since more formally required in the following clause of the agreement of reference: 'And he (Mr. Cooke) also claims a right of inserting in recitals in all documents which he may be called upon to sign, in relation to the said separate rights and benefits, a clear statement of the grounds expressed by the said parties at the time (whatever grounds really were then expressed), as the grounds upon which the said separate rights and benefits were claimed or asked for by the said Charles Wheatstone, and conceded by the said William Fothergill Cooke.'"—*Cooke's Evidence*, § 718—727.

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